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TEST REPORT

Product Name .... : 150Mbps Wireless N USB Adapter With High Gain Antenna

Trademark .... : Panda Wireless

Model/Type reference............... : PAU08

Listed Model(s)......................... : /

FCC ID .... : 2ADUTLGPAU08

Test Standards.......................... : **ANSI C95.1–1999**
47CFR §2.1093
IEEE 1528-2003

Applicant................................... : Panda Wireless, Inc

Address of applicant................ : 15559 Union Ave, Suite 300, Los Gatos, CA 95032

Date of Receipt......................... : Jun. 17, 2015

Date of Test Date...................... : Sep. 17, 2015

Data of issue............................. : Sep. 19, 2015

Test result	Pass *

* In the configuration tested, the EUT complied with the standards specified above

GENERAL DESCRIPTION OF EUT	
Equipment:	150Mbps Wireless N USB Adapter With High Gain Antenna
Model Name:	PAU08
Manufacturer:	Panda Wireless, Inc
Manufacturer Address:	15559 Union Ave, Suite 300, Los Gatos, CA 95032
Power Rating:	DC 5V via PC USB

Compiled By: Thomas Morgan
(Thomas Morgan)

Reviewed By: Tony Wang
(Tony Wang)

Approved By: Walter Chen
(Walter Chen)

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1. SUMMARY

1.1 Test Standards

IEEE Std C95.1, 1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 KHz to 300 GHz. It specifies the maximum exposure limit of 1.6 W/kg as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

IEEE Std 1528™-2003: IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

FCC Part 2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices

KDB 447498 D01 Mobile Portable RF Exposure v05r02: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

KDB 447498 D02 SAR Procedures for Dongle Xmtr v02: SAR Measurement Procedures for USB Dongle Transmitters

KDB865664 D01 SAR measurement 100 MHz to 6 GHz v01r03: SAR Measurement Requirements for 100 MHz to 6 GHz

KDB865664 D02 SAR Reporting v01r01: RF Exposure Compliance Reporting and Documentation Considerations

KDB248227 D01 802.11 Wi-Fi SAR v02r01: SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

1.2 Summary of Maximum SAR Value

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

Body SAR

Mode	Test Position	Channel /Frequency (MHz)	Limit SAR_{1g} 1.6 W/kg	
			Highest Tested 1g-SAR(W/Kg)	Highest Scaled Maximum SAR(W/Kg)
802.11b 1Mbps data rates	Horizontal UP	1/2412	0.813	0.894
802.11b 1Mbps data rates	Horizontal UP with antenna bent at 90°	1/2412	0.144	0.158
802.11b 1Mbps data rates	Horizontal Down	1/2412	0.353	0.388
802.11b 1Mbps data rates	Vertical Front	1/2412	0.950	**1.045**

Note:

1. This device is compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6W/Kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1, and had been tested in accordance with measurement methods and procedures specified in IEEE 1528-2003 and the relevant KDB files.

1.3 Test Facility

1.3.1 Address of the test laboratory

The Testing and Technology Center for Industrial Products of Shenzhen Entry-Exit Inspection and Quarantine Bureau

No.289, 8th Industry Road, Nanshan District, Shenzhen, Guangdong, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2009) and CISPR Publication 22.

1.3.2 Laboratory accreditation

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

CNAS-Lab Code: L2872

The Testing and Technology Center for Industrial Products of Shenzhen Entry-Exit Inspection and Quarantine Bureau has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories, Date of Registration: May 11, 2014. Valid time is until May 12, 2017.

1.4 Measurement Uncertainty (300MHz-3GHz)

No.	Error Description	Type	Uncertainty Value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement System										
1	Probe calibration	B	6.55%	N	1	1	1	6.55%	6.55%	∞
2	Axial isotropy	B	4.70%	R	$\sqrt{3}$	0.7	0.7	1.90%	1.90%	∞
3	Hemispherical isotropy	B	9.60%	R	$\sqrt{3}$	0.7	0.7	3.88%	3.88%	∞
4	Boundary Effects	B	1.00%	R	$\sqrt{3}$	1	1	0.58%	0.58%	∞
5	Probe Linearity	B	4.70%	R	$\sqrt{3}$	1	1	2.71%	2.71%	∞
6	Detection limit	B	1.00%	R	$\sqrt{3}$	1	1	0.58%	0.58%	∞
7	Readout Electronics	A	0.30%	N	1	1	1	0.30%	0.30%	∞
8	Response Time	B	0.00%	R	$\sqrt{3}$	1	1	0.00%	0.00%	∞
9	Integration Time	B	0.00%	R	$\sqrt{3}$	1	1	0.00%	0.00%	∞
10	RF ambient conditions-noise	B	1.00%	R	$\sqrt{3}$	1	1	0.58%	0.58%	∞
11	RF ambient conditions-reflection	B	1.00%	R	$\sqrt{3}$	1	1	0.58%	0.58%	∞
12	Probe positioned mech. restrictions	B	0.80%	R	$\sqrt{3}$	1	1	0.46%	0.46%	∞

13	Probe positioning with respect to phantom shell	B	6.70%	R	$\sqrt{3}$	1	1	3.87%	3.87%	∞
14	Max.SAR evaluation	B	2.00%	R	$\sqrt{3}$	1	1	1.15%	1.15%	∞
Test Sample Related										
15	Test sample positioning	A	1.86%	N	1	1	1	1.86%	1.86%	∞
16	Device holder uncertainty	A	1.70%	N	1	1	1	1.70%	1.70%	∞
17	Drift of output power	B	5.00%	R	$\sqrt{3}$	1	1	2.89%	2.89%	∞
Phantom and Set-up										
18	Phantom uncertainty	B	4.00%	R	$\sqrt{3}$	1	1	2.31%	2.31%	∞
19	Liquid conductivity (target)	B	5.00%	R	$\sqrt{3}$	0.64	0.43	1.85%	1.24%	∞
20	Liquid conductivity (meas.)	A	2.50%	N	1	0.64	0.43	1.60%	1.08%	∞
21	Liquid permittivity (target)	B	5.00%	R	$\sqrt{3}$	0.60	0.49	1.73%	1.41%	∞
22	Liquid permittivity (meas.)	A	2.50%	N	1	0.60	0.49	1.50%	1.23%	∞
Combined standard uncertainty	$u_c=\sqrt{\sum_{i=1}^{22} c_i^2 u_i^2}$		/	/	/	/	/	10.87%	10.63%	∞
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$		/	R	K=2	/	/	21.73%	21.27%	∞

1.5 System Check Uncertainty

No.	Error Description	Type	Uncertainty Value	Probably Distribution	Div.	(Ci) 1g	(Ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	Degree of freedom
Measurement System										
1	Probe calibration	B	6.55%	N	1	1	1	6.55%	6.55%	∞
2	Axial isotropy	B	4.70%	R	$\sqrt{3}$	0.7	0.7	1.90%	1.90%	∞
3	Hemispherical isotropy	B	9.60%	R	$\sqrt{3}$	0.7	0.7	3.88%	3.88%	∞
4	Boundary Effects	B	1.00%	R	$\sqrt{3}$	1	1	0.58%	0.58%	∞
5	Probe Linearity	B	4.70%	R	$\sqrt{3}$	1	1	2.71%	2.71%	∞
6	Detection limit	B	1.00%	R	$\sqrt{3}$	1	1	0.58%	0.58%	∞
7	Readout Electronics	A	0.30%	N	1	1	1	0.30%	0.30%	∞
8	Response Time	B	0.00%	R	$\sqrt{3}$	1	1	0.00%	0.00%	∞

9	Integration Time	B	0.00%	R	$\sqrt{3}$	1	1	0.00%	0.00%	∞
10	RF ambient conditions-noise	B	1.00%	R	$\sqrt{3}$	1	1	0.58%	0.58%	∞
11	RF ambient conditions-reflection	B	1.00%	R	$\sqrt{3}$	1	1	0.58%	0.58%	∞
12	Probe positioned mech. restrictions	B	0.80%	R	$\sqrt{3}$	1	1	0.46%	0.46%	∞
13	Probe positioning with respect to phantom shell	B	6.70%	R	$\sqrt{3}$	1	1	3.87%	3.87%	∞
14	Max.SAR evaluation	B	2.00%	R	$\sqrt{3}$	1	1	1.15%	1.15%	∞
Dipole Related										
15	Dev. of experimental dipole	B	5.50%	R	$\sqrt{3}$	1	1	3.18%	3.18%	∞
16	Dipole Axis to Liquid Dist.	B	2.00%	R	$\sqrt{3}$	1	1	1.15%	1.15%	∞
17	Input power & SAR drift	B	3.40%	R	$\sqrt{3}$	1	1	1.96%	1.96%	∞
Phantom and Setup										
18	Phantom uncertainty	B	4.00%	R	$\sqrt{3}$	1	1	2.31%	2.31%	∞
19	SAR correction	B	1.90%	R	$\sqrt{3}$	1	0.84	1.10%	0.92%	
20	Liquid conductivity (meas.)	A	2.50%	N	1	0.78	0.71	1.95%	1.78%	∞
21	Liquid permittivity (meas.)	A	2.50%	N	1	0.26	0.26	0.65%	0.65%	∞
22	Temp. unc. - Conductivity	B	1.70%	R	$\sqrt{3}$	0.78	0.71	0.77%	0.70%	∞
23	Temp. unc. - Permittivity	B	0.30%	R	$\sqrt{3}$	0.23	0.26	0.04%	0.05%	∞
Combined standard uncertainty	$u_C = \sqrt{\sum_{i=1}^{23} c_i^2 u_i^2}$	/	/	/	/	/	10.65%	10.60 %	∞	
Expanded uncertainty (confidence interval of 95 %)	$u_e = 2u_c$	/	R	K=2	/	/	21.31%	21.20 %	∞	

2. GENERAL INFORMATION

2.1 Environmental conditions

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

Normal Temperature:	22°C
Relative Humidity:	35%-55 %
Air Pressure:	101 kPa

2.2 General Description of EUT

Product Name:	150Mbps Wireless N USB Adapter With High Gain Antenna
Model/Type reference:	PAU08
Test Device	Prototype
Power supply:	DC 5V via PC USB
Hardware version:	1490M_MM1_V1.0
Software version:	V3.2.9.0
WIFI:	
Supported type:	802.11b/802.11g/802.11n(H20)/802.11n(H40)
Modulation Type:	802.11b: DSSS 802.11g/802.11n(H20)/802.11n(H40): OFDM
Operation frequency:	802.11b/802.11g/802.11n(H20): 2412MHz~2462MHz 802.11n(H40): 2422MHz~2452MHz
Channel number:	802.11b/802.11g/802.11n(H20): 11 802.11n(H40): 7
Channel separation:	5MHz
Antenna type:	Integral Antenna
Antenna gain:	5dBi

2.3 Description of Test Modes

The EUT has been tested under typical operating condition and The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

2.4 Measurement Instruments List

Test Equipment	Manufacturer	Type/Model	Serial Number	Calibrated until
Data Acquisition Electronics DAEx	SPEAG	DAE4	1315	Jul. 21,2016
E-field Probe	SPEAG	ES3DV3	3292	Aug 14,2016
System Validation Dipole 2450V2	SPEAG	D2450V2	884	Aug 31,2016
Dielectric Probe Kit	SPEAG	DAK-3.5	0126	Mar. 05,2016
Power meter	Agilent	N914A	MY52090010	Mar. 05,2016
Power sensor	Agilent	E9304A	MY52140008	Mar. 05,2016
Power sensor	Agilent	E9301H	MY54470001	Mar. 05,2016
Network analyzer	Agilent	N9923A	MY51491493	Mar. 05,2016
Signal Generator	Agilent	E8257D	MY46521908	Jun. 05,2016
Dual Directional Coupler	Agilent	772D	MY48220612	Mar. 05,2016
Power Amplifier	Mini-Circuits	ZHL-42W	13440021132	Mar. 05,2016
Attenuator 3dB	Agilent	8491A	MY39268101	Mar. 05,2016

Note: 1. The Cal. Interval was one year.

3. SAR MEASUREMENTS SYSTEM CONFIGURATION

3.1 SAR MEASUREMENT SET-UP

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

A standard high precision 6-axis robot (Stäubli RX family) with controller and software.

An arm extension for accommodating the data acquisition electronics (DAE).

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

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

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

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

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

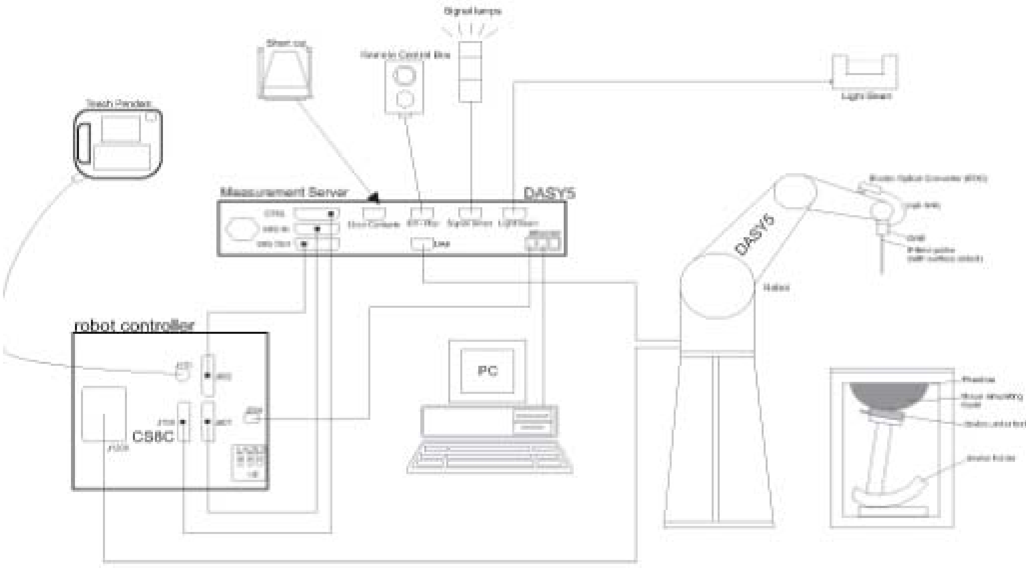
Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.

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

The device holder for handheld Mobile Phones.

Tissue simulating liquid mixed according to the given recipes.

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



3.2 DASY5 E-FIELD PROBE SYSTEM

The SAR measurements were conducted with the dosimetric probe ES3DV3 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

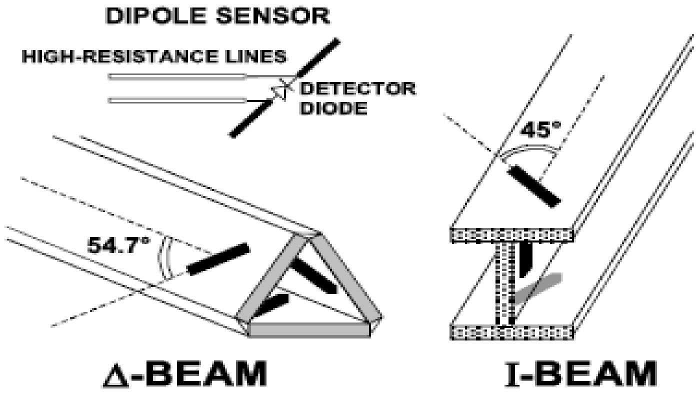
Probe Specification:

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100 W/kg; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of Mobile Phones
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

Isotropic E-Field Probe:

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

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



3.3 PHANTOMS

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

SAM Twin Phantom

3.4 DEVICE HOLDER

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

Device holder supplied by SPEAG

3.5 SCANNING PROCEDURE

The DASY5 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %.

The “surface check” measurement tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe

(It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement

(b) Area scan

(c) Zoom scan

(d) Power drift measurement

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 dB0 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 D01v01r03 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: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

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 D01v01r03 SAR measurement 100 MHz to 6 GHz.

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

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% (0.21dB), the SAR will be retested.

Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan

(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)

(c) Generation of a high-resolution mesh within the measured volume

(d) Interpolation of all measured values form the measurement grid to the high-resolution grid

(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface

(f) Calculation of the averaged SAR within masses of 1g and 10g

3.6 DATA STORAGE AND EVALUATION

Data Storage

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

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

Data Evaluation

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

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

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY5 components. In the direct measuring mode of the 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 Vi = compensated signal of channel i (i = x, y, z)
Ui = input signal of channel i (i = x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcpi = diode compression point (DASY parameter)

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

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

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

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

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

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

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

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

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

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

4. TISSUE SIMULATING LIQUID

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15cm. For head SAR testing the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15cm For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15cm.The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in 4.2

4.1 The composition of the tissue simulating liquid

Ingredient	2450MHz
(% Weight)	Body
Water	73.2
Salt	0.10
Sugar	0.00
Preventol	0.00
HEC	0.00
DGBE	26.7

4.2 Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using SPEAG Dielectric Probe Kit and Agilent Network Analyzer N9923A.

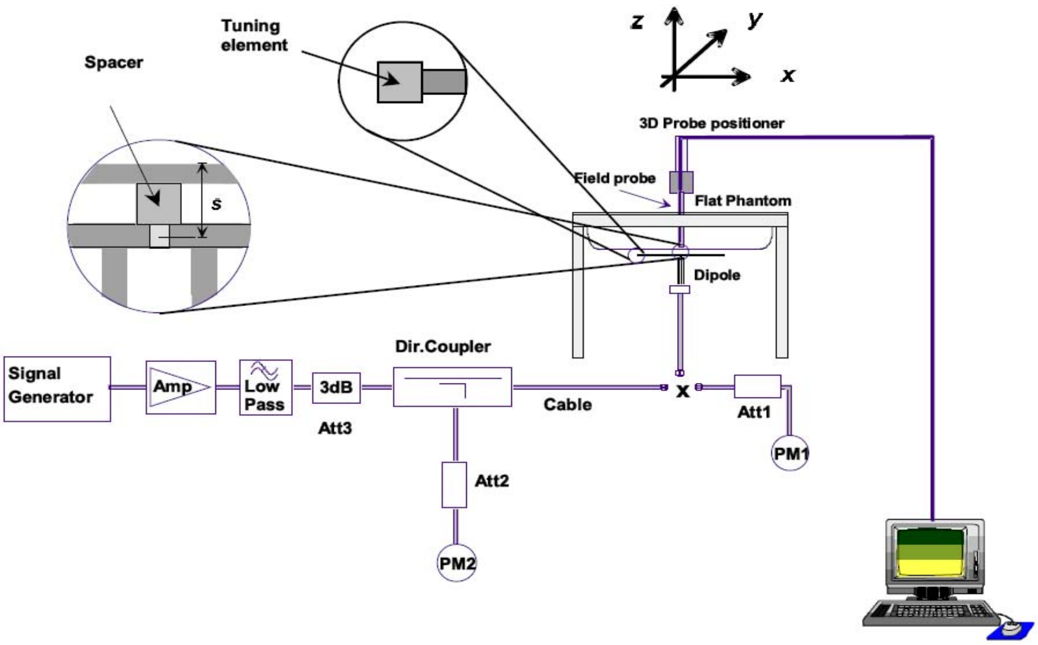
Frequency (MHz)		Dielectric Parameters (±5%)		Tissue Temp [° C]	Test Date
2450	body	εr 50.065-55.335	δ[s/m] 1.8525-2.0475	22	Sep.,17,2015
		50.88	2.01		

5. System Check

The purpose of the system check is to verify that the system operates within its specifications at the device test frequency. The system check is simple check of repeatability to make sure that the system works correctly at the time of the compliance test;

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY5 system.



The output power on dipole port must be calibrated to 24 dBm (250mW) before dipole is connected.

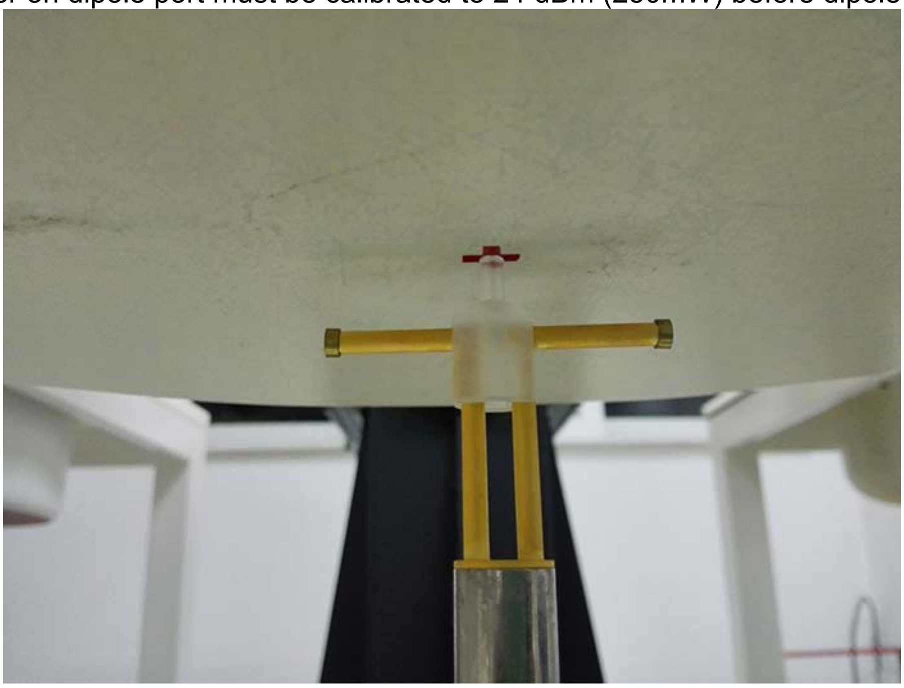


Photo of Dipole Setup

System Check in Body Tissue Simulating Liquid

Measurement is made at temperature 22.0 ℃ and relative humidity 55%.						Measurement Date
Verification results	Frequency (MHz)	Target value (W/kg)	Measured 250mW value (W/kg)	Normalized 1W value (W/kg)	Deviation	
	2450	51.60	12.89	51.56	-0.08%	Sep.,17,2015
Note：1. The test plots see Chapter9. 2. Target Values used derive from the calibration certificate						

6. EUT TEST POSITION

6.1 Body Positions

(1) To position the EUT parallel to the phantom surface with all sides.

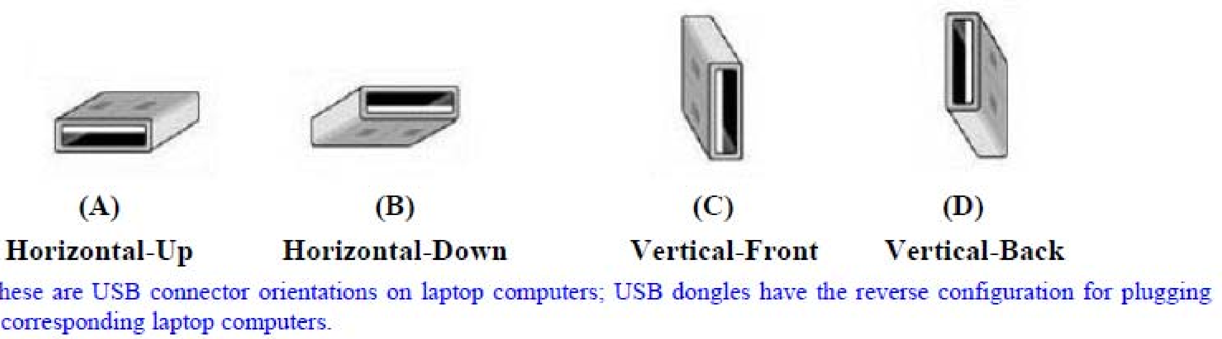
(2) To adjust the EUT parallel to the flat phantom.

(3) To adjust the distance between the EUT surface and the flat phantom to 5mm.

6.2 RF Exposure Positions

This Device is a WLAN Adapter with Micro USB port and a cable must be used to connect with computer.

An external antenna (cannot be detached from the adapter) is on the right side of the EUT respectively that may swivel and rotate，on the left side is a decorating antenna without soldering on the PCB(it's non-functional).



USB Connector Orientations Implemented on Laptop Computers

For SAR testing, the device should still follow the USB dongle procedures in KDB 447498 D02 and use a 5mm test separation distance. Treat the device as though there was a full sized USB connector attached to it (as a standard USB dongle has). It is understood that a cable must be used instead of a direct laptop connection. Because the device uses external dipole antennas, the normal testing of 4 sides and tip does not apply.

Test the Horizontal Up and Horizontal Down positions of the dongle with the antennas in straight mode. The testing of the tip is not necessary. If the two measured SAR levels are similar, then additionally test the Horizontal Up position with the antennas bent at 90 degrees, perpendicular to the phantom (antennas pointing down and away from the phantom) and SAR testing conditions for this dongle will be satisfied (3 test positions total).

If the SAR levels for the Horizontal Up and Horizontal Down positions of the dongle in antennas straight mode are not similar, then the antennas are not symmetrical and the Vertical Front and Vertical Back positions in antennas straight mode also need to be tested (5 test positions total).

7. Measurement Procedures

The measurement procedures are as follows:

7.1 Conducted power measurement

a) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously Transmission, at maximum RF power in each supported wireless interface and frequency band.

b) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power.

7.2 SAR measurement

7.2.1 WIFI Test Configuration

For WLAN SAR testing, WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal. The Tx power is set to maximum limit for 802.11 b mode by software.

For the 802.11b/g/n SAR tests, the EUT is operated at the RF continuous emission mode. 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. When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11g/n mode is used for SAR measurement.

Per KDB447498 4.3.3, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g SAR for the mid-band or highest output power channel is: ≤ 0.8 W/kg, when the transmission band is ≤ 100 MHz.

SAR is not required for 2.4 GHz 802.11g/n OFDM configurations when KDB Publication 447498 SAR test exclusion applies to the OFDM configuration or 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.

8. TEST CONDITIONS AND RESULTS

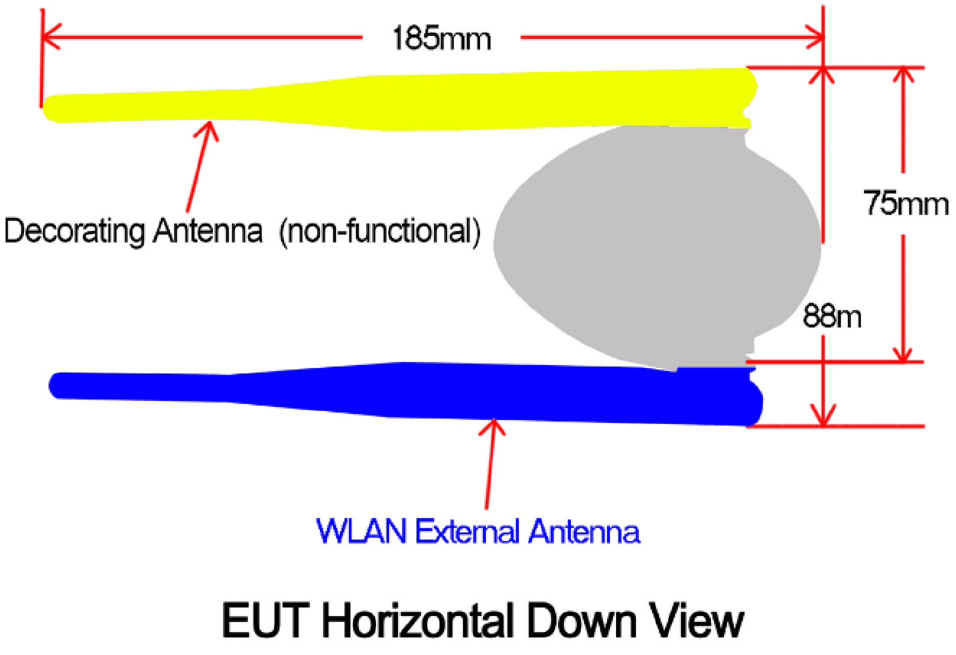
8.1 Conducted Power Results

Max Conducted power measurement results and power drift from tune-up tolerance provide by manufacturer:

Conducted Power Measurement Results (Wi-Fi 802.11 b/g/n)

Wi-Fi 2450MHz	Channel/ Freq.(MHz)	Tune-up Limit(dBm)	Average Power (dBm) for Data Rates (Mbps)							
			1	2	5.5	11	/	/	/	/
802.11b	1(2412)	21.5	21.08	21.00	20.93	20.94	/	/	/	/
	6(2437)	21.5	20.66	20.64	20.61	20.62	/	/	/	/
	11(2462)	21.5	20.87	20.83	20.76	20.79	/	/	/	/
802.11g	Channel	All	6	9	12	18	24	36	48	54
	1(2412)	14.5	13.63	13.51	13.58	13.63	13.57	13.50	13.55	13.57
	6(2437)	14.5	13.88	13.77	13.81	13.84	13.88	13.85	13.79	13.85
	11(2462)	14.5	13.47	13.39	13.47	13.41	13.41	13.47	13.42	13.35
802.11n (HT20)	Channel	All	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
	1(2412)	14.5	13.94	13.88	13.92	13.87	13.82	13.88	13.79	13.82
	6(2437)	14.5	14.06	13.92	14.03	14.04	13.94	14.04	14.05	13.91
	11(2462)	14.5	13.40	13.27	13.33	13.35	13.26	13.30	13.35	13.32
802.11n (HT40)	Channel	All	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
	3(2422)	14.5	14.16	14.11	14.13	14.15	14.12	14.13	14.05	14.14
	6(2437)	14.5	14.01	13.95	14.01	13.92	13.88	13.88	13.92	13.90
	9(2452)	14.5	13.52	13.42	13.48	13.38	13.52	13.50	13.40	13.44

8.2 Antenna Location



SAR Measurement Positions

According to the KDB447498 D01 General RF Exposure Guidance v05r02, the test exclusion threshold is determined by the closet separation between the antenna and the user, if the test separation distance is <5mm, 5mm is used to determine SAR exclusion threshold.

Per KDB447498 D01, 4.3.1. Standalone SAR test exclusion considerations

1) 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:
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

2) At 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B:

a) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·(f(MHz)/150)] mW, at 100 MHz to 1500 MHz

b) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

SAR test exclusion table

Exposure Position	Wireless Interface	802.11 b/g/n
	Tune-up Maximum Power(dBm)	21.5
	Tune-up Maximum Power(mW) **rounded**	141
Horizontal Up	Antenna to User(mm)	2
	SAR exclusion threshold(mW)	10
	SAR test required?	Yes
Horizontal Down	Antenna to User(mm)	7
	SAR exclusion threshold(mW)	13
	SAR test required?	Yes
Vertical Front	Antenna to User(mm)	0
	SAR exclusion threshold(mW)	10
	SAR test required?	Yes
Vertical Back	Antenna to User(mm)	75
	SAR exclusion threshold(mW)	346
	SAR test required?	No
Horizontal Up with the antenna bent at 90 degrees	Antenna to User(mm)	2
	SAR exclusion threshold(mW)	10
	SAR test required?	Yes

8.3 TEST RESULTS

8.3.1 SAR Test Results Summary

Operation Mode ·

- Per KDB 447498 D01 v05r02, for each exposure position, if the highest 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional.
- Per KDB 447498 D01v05r02, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
  1) 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.
  2) Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
- Per KDB 865664 D01 v01r03, for each frequency band, if the measured SAR is ≥0.8W/Kg, testing for repeated SAR measurement is required, that the highest measured SAR is only to be tested. When the SAR results are near the limit, the following procedures are required for each device to verify these types of SAR measurement related variation concerns by repeating the highest measured SAR configuration in each frequency band.
  1) When the original highest measured SAR is ≥0.8W/Kg, repeat that measurement once.
  2) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥1.45 W/Kg.
  3) Perform a third repeated measurement only if the original, first and second repeated measurement is ≥1.5 W/Kg and ratio of largest to smallest SAR for the original, first and second measurement is ≥1.20.
- According to KDB 248227 D01 802.11 Wi-Fi SAR v02r01 section5.2.1, SAR is measured for 2.4 GHz 802.11b DSSS using either a fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

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

  2) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.
- According to KDB 248227 D01 802.11 Wi-Fi SAR v02r01 section5.2.2, SAR is not required for the following 2.4 GHz OFDM conditions.

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

  2) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

8.3.2 Standalone SAR

SAR Values (802.11b with 1Mbps data rates)

Test Position	Channel/ Frequency (MHz)	Service	Duty Cycle	Maximum Allowed Power (dBm)	Conducted Power (dBm)	Drift ±0.21dB	Limit of SAR 1.6 W/kg			
						Drift (dB)	Measured SAR_{1g} (W/kg)	Tune-up Scaling Factor	Reported SAR_{1g} (W/kg)	Graph Results
Test position of Body (Distance 5mm)										
Horizontal Up	1/2412	DSSS	1:1	21.5	21.08	0.05	0.813	1.10	0.894	Figure.1
Horizontal Up	6/2437	DSSS	1:1	21.5	20.66	0.02	0.691	1.21	0.836	N/A
Horizontal Up	11/2462	DSSS	1:1	21.5	20.87	0.04	0.736	1.16	0.854	N/A
Horizontal up with antenna bent at 90°	1/2412	DSSS	1:1	21.5	21.08	0.15	0.144	1.10	0.158	Figure.2
Horizontal Down	1/2412	DSSS	1:1	21.5	21.08	0.17	0.353	1.10	0.388	Figure.3
Vertical Front	1/2412	DSSS	1:1	21.5	21.08	0.07	0.950	1.10	1.045	Figure.4
Vertical Front	6/2437	DSSS	1:1	21.5	20.66	0.11	0.796	1.21	0.963	N/A
Vertical Front	11/2462	DSSS	1:1	21.5	20.87	0.14	0.844	1.16	0.979	N/A
Worst Case Position of Body (1st Repeated SAR, Distance 5mm)										
Vertical Front	1/2412	DSSS	1:1	21.5	21.08	0.04	0.948	1.10	1.043	N/A

Note: 1. The value with green color is the maximum SAR Value of each test band.
2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is optional for such test configuration(s).
3. Per FCC KDB 248227, when the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
4. Per FCC KDB 248227, 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. Since ratio of OFDM to DSSS specified maximum output power is: 28mW/141mW=0.20(802.11g, 802.11n (20MHz/40MHz)), the adjusted SAR is less than 1.045∗0.20=0.209 W/kg<1.2W/kg, SAR is not required for 2.4 GHz OFDM conditions.

9. System Check Results

System Performance Check at 2450 MHz Body

Date: 17/09/2015

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 884

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

Medium parameters used (interpolated): f = 2450 MHz; σ = 2.01 S/m; ε_r = 50.88; ρ = 1000 kg/m^3

Phantom section: Flat Section

DASY5 Configuration:

- •Probe: ES3DV3 - SN3292; ConvF (4.23, 4.23, 4.23); Calibrated: 15/08/2015;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (8x8x1): Measurement grid: dx=12.00 mm, dy=12.00 mm

Maximum value of SAR (measured) = 16.53 W/kg

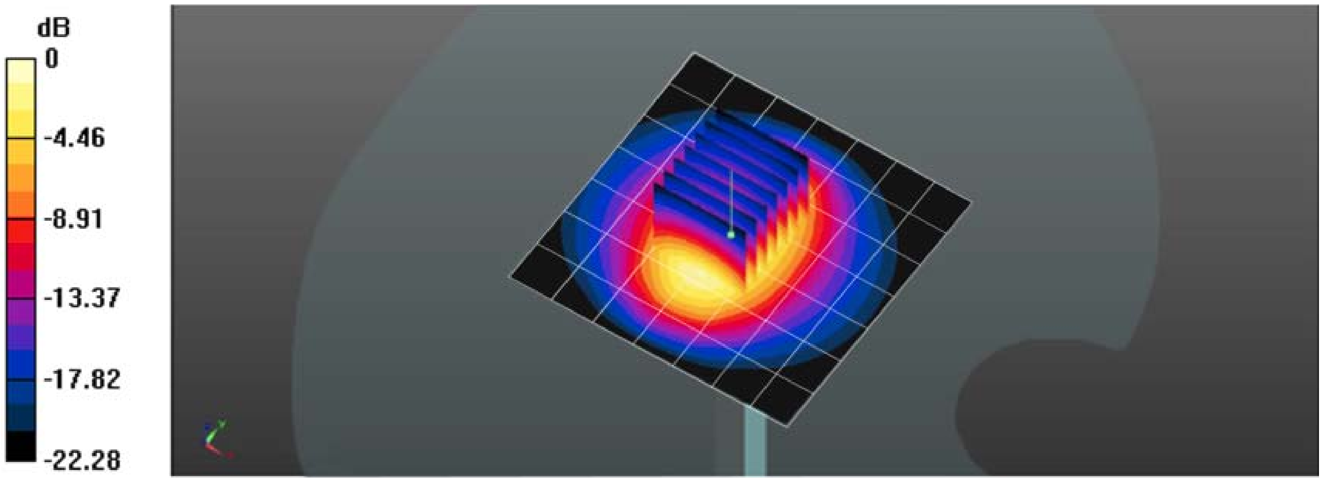
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.245 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 27.57 W/kg

SAR (1 g) = 12.89 W/kg; SAR (10 g) = 6.02 W/kg

Maximum value of SAR (measured) = 16.53 W/kg



0 dB = 16.53 W/kg = 12.18 dB W/kg

System Performance Check 2450MHz Body 250mW

10. SAR Test Graph Results

802.11b Horizontal Up Low Channel

Date: 17/09/2015

Communication System: Customer System; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.98 S/m; ε_r = 51.02; ρ = 1000 kg/m^3

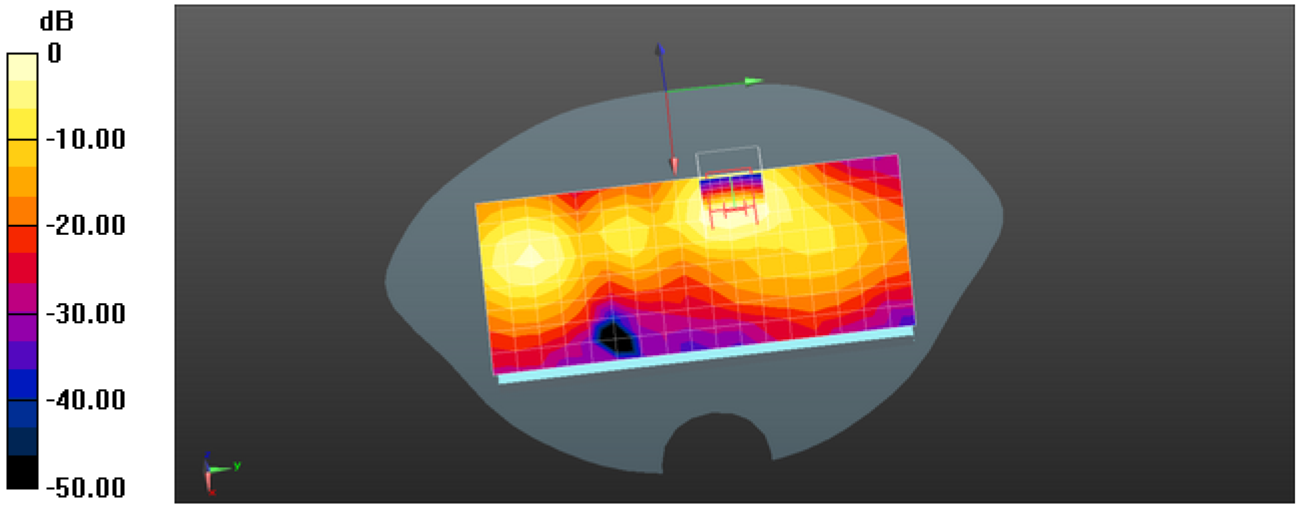
Phantom section: Flat Section

DASY5 Configuration:

- •Probe: ES3DV3 - SN3292; ConvF (4.23, 4.23, 4.23); Calibrated: 15/08/2015;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (9x18x1): Measurement grid: dx=12 mm, dy=12 mm
Maximum value of SAR (measured) = 0.818 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.482 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.644 W/kg
SAR(1 g) = 0.813 W/kg; SAR(10 g) = 0.396 W/kg
Maximum value of SAR (measured) = 0.826 W/kg



0 dB = 0.818 W/kg = -0.87 dB W/kg

Figure 1: Horizontal Up 802.11b Channel 1

802.11b Horizontal Up with antenna bent 90° Low Channel

Date: 17/09/2015

Communication System: Customer System; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.98 S/m; ε_r = 51.02; ρ = 1000 kg/m^3

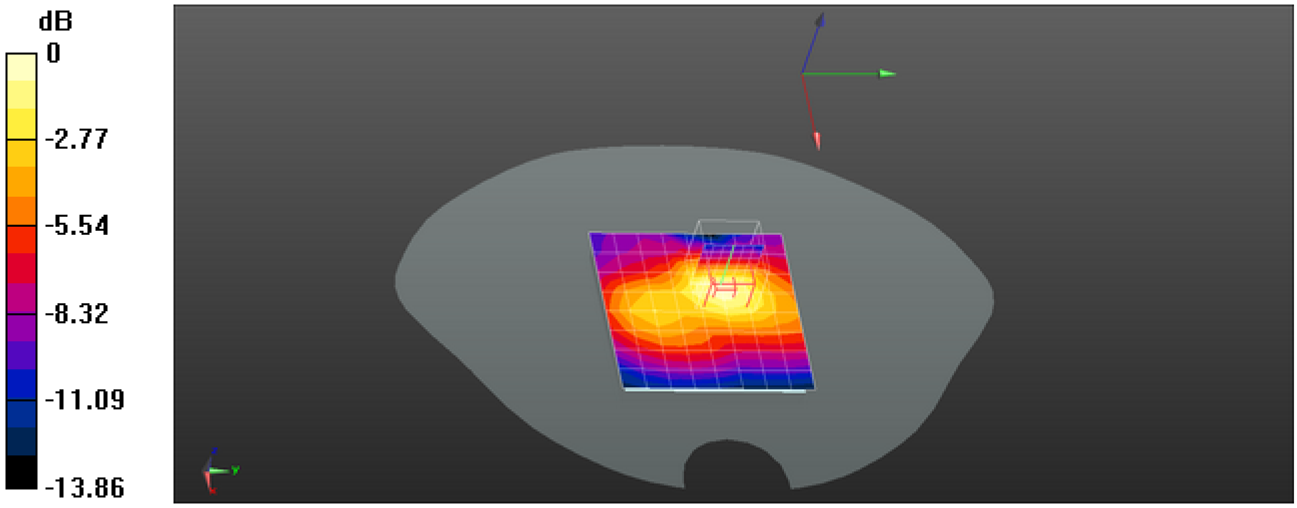
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3292; ConvF (4.23, 4.23, 4.23); Calibrated: 15/08/2015;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (9x9x1): Measurement grid: dx=12 mm, dy=12 mm
Maximum value of SAR (measured) = 0.155 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.475 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 0.291 W/kg
SAR(1 g) = 0.144 W/kg; SAR(10 g) = 0.074 W/kg
Maximum value of SAR (measured) = 0.157 W/kg



0 dB = 0.155 W/kg = -8.10 dB W/kg

Figure 2: Horizontal Up with antenna bent 90° 802.11b Channel 1

802.11b Horizontal Down Low Channel

Date: 17/09/2015

Communication System: Customer System; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.98 S/m; ε_r = 51.02; ρ = 1000 kg/m^3

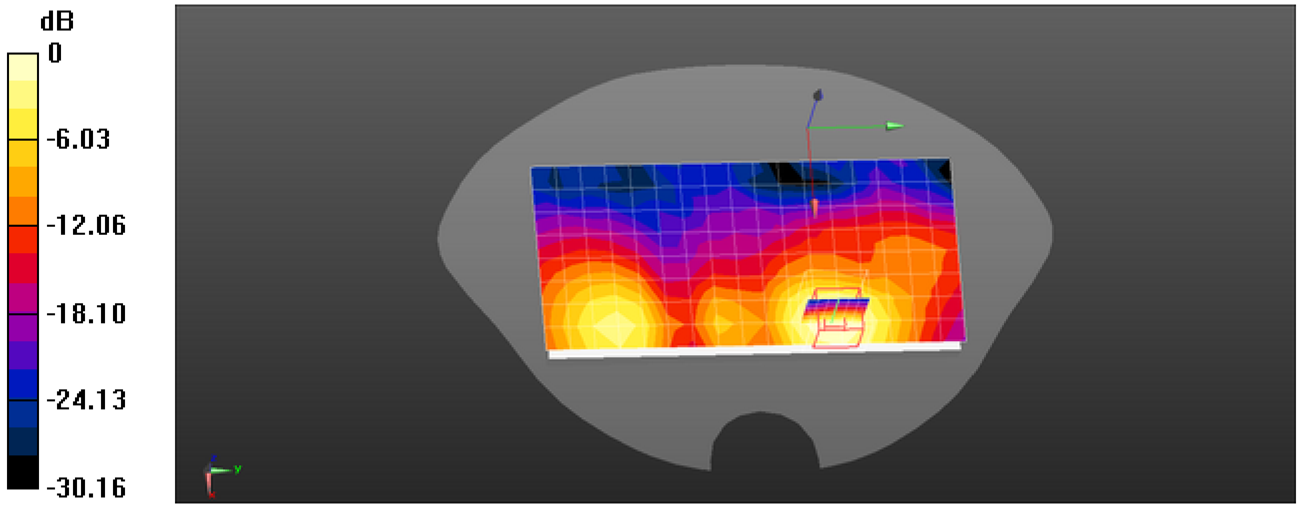
Phantom section: Flat Section

DASY5 Configuration:

- •Probe: ES3DV3 - SN3292; ConvF (4.23, 4.23, 4.23); Calibrated: 15/08/2015;
- •Sensor-Surface: 4mm (Mechanical Surface Detection)
- •Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
- •Phantom: SAM 1; Type: SAM;
- •Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (9x18x1): Measurement grid: dx=12 mm, dy=12 mm
Maximum value of SAR (measured) = 0.377 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.348 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.679 W/kg
SAR(1 g) = 0.353 W/kg; SAR(10 g) = 0.183 W/kg
Maximum value of SAR (measured) = 0.386 W/kg



0 dB = 0.377 W/kg = -4.24 dB W/kg

Figure 3: Horizontal Down 802.11b Channel 1

802.11b Vertical Front Low Channel

Date: 17/09/2015

Communication System: Customer System; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.98 S/m; ε_r = 51.02; ρ = 1000 kg/m^3

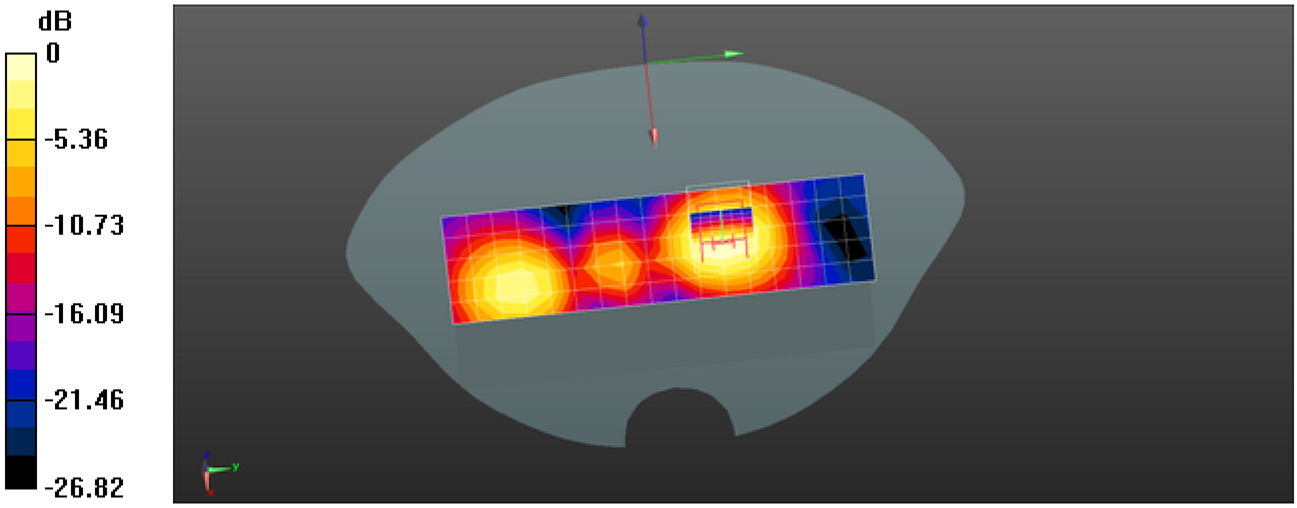
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3292; ConvF (4.23, 4.23, 4.23); Calibrated: 15/08/2015;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 22/07/2015
- Phantom: SAM 1; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Area Scan (9x18x1): Measurement grid: dx=12 mm, dy=12 mm
Maximum value of SAR (measured) = 0.921 W/kg

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.863 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.882 W/kg
SAR(1 g) = 0.950 W/kg; SAR(10 g) = 0.476 W/kg
Maximum value of SAR (measured) = 1.06 W/kg



0 dB = 0.921 W/kg = -0.36 dB W/kg

Figure 4: Vertical Front 802.11b Channel 1

11. CALIBRATION CERTIFICATE

11.1 Probe Calibration Certificate ES3DV3 (3292)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **CIQ (Auden)**

Certificate No: **ES3-3292_Aug15**

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3292

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: August 15, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-15 (No. 217-01911)	Apr-16
Power sensor E4412A	MY41498087	03-Apr-15 (No. 217-01911)	Apr-16
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-15 (No. 217-01915)	Apr-16
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-15 (No. 217-01919)	Apr-16
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-15 (No. 217-01920)	Apr-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	13-Dec-14 (No. DAE4-660_Dec14)	Dec-15
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 15, 2015

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

Certificate No: ES3-3292_Aug15 Page 1 of 11

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

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.e., 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, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect 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 with CW signal (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; Dx,y,z; VRx,y,z: A, B, C, D* 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 ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values 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 ± 50 MHz to ± 100 MHz.
- *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).

Probe ES3DV3

SN:3292

Manufactured: July 6, 2010
Repaired: July 28, 2014
Calibrated: August 15, 2015

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

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ES3DV3– SN:3292 August 15, 2015

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.89	0.95	1.46	± 10.1 %
DCP (mV)[B]	107.1	106.1	103.9	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	209.7	±3.8 %
		Y	0.0	0.0	1.0		218.8	
		Z	0.0	0.0	1.0		198.5	

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 NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty 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: ES3DV3 - SN:3292

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
835	41.5	0.90	6.23	6.23	6.23	0.80	1.11	± 12.0 %
900	41.5	0.97	6.10	6.10	6.10	0.76	1.17	± 12.0 %
1810	40.0	1.40	5.07	5.07	5.07	0.61	1.36	± 12.0 %
1900	40.0	1.40	5.03	5.03	5.03	0.45	1.55	± 12.0 %
2100	39.8	1.49	5.04	5.04	5.04	0.77	1.17	± 12.0 %
2450	39.2	1.80	4.43	4.43	4.43	0.73	1.23	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the 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 frequencies 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 frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292

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)
450	56.7	0.94	7.10	7.10	7.10	0.13	1.00	± 13.3 %
835	55.2	0.97	6.11	6.11	6.11	0.36	1.78	± 12.0 %
900	55.0	1.05	5.97	5.97	5.97	0.73	1.22	± 12.0 %
1810	53.3	1.52	4.79	4.79	4.79	0.59	1.45	± 12.0 %
1900	53.3	1.52	4.66	4.66	4.66	0.41	1.79	± 12.0 %
2100	53.2	1.62	4.77	4.77	4.77	0.63	1.42	± 12.0 %
2450	52.7	1.95	4.23	4.23	4.23	0.66	0.98	± 12.0 %

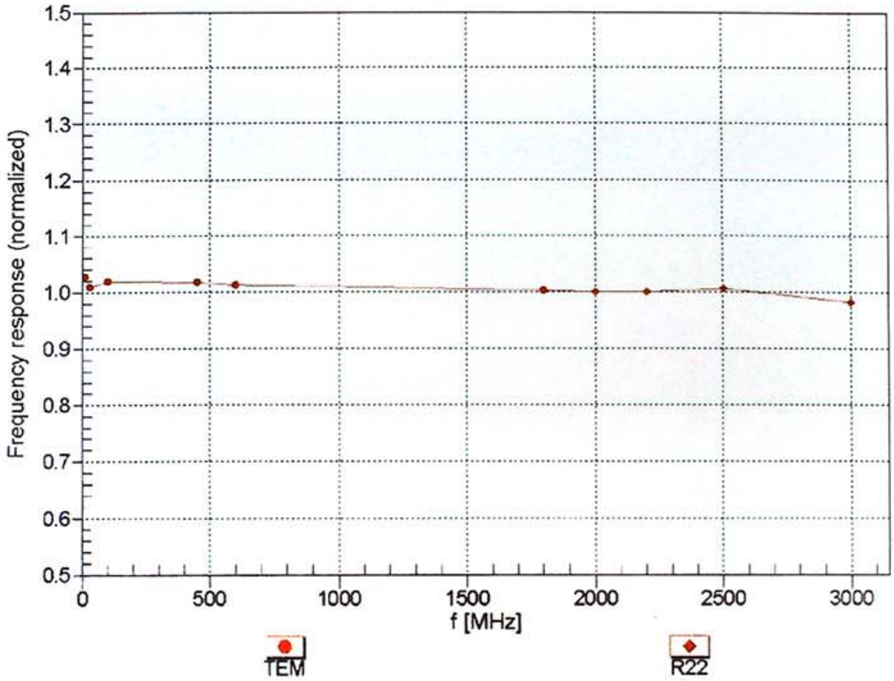
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz 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 frequencies 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 frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)

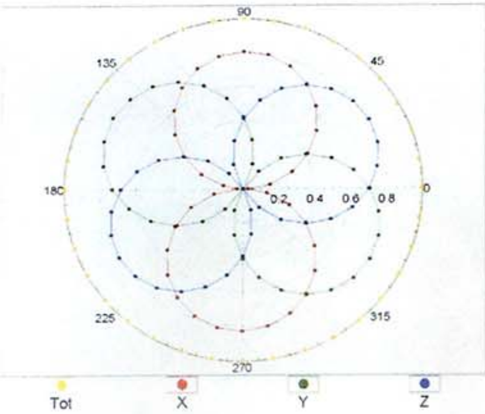


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

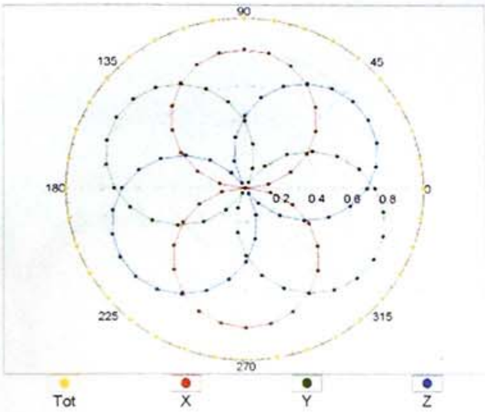
ES3DV3– SN:3292 August 15, 2015

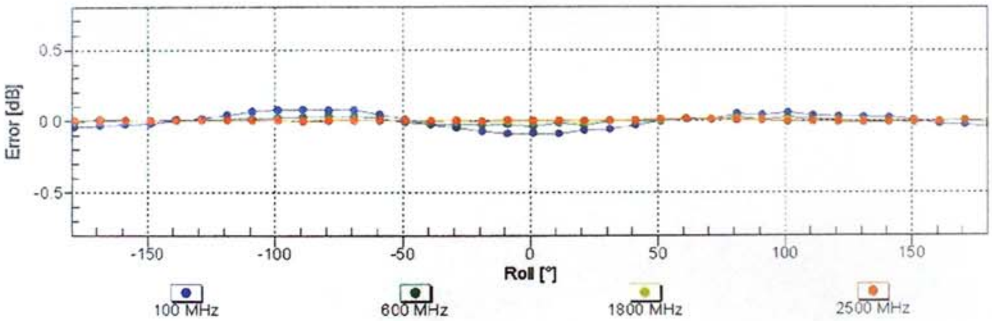
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22





Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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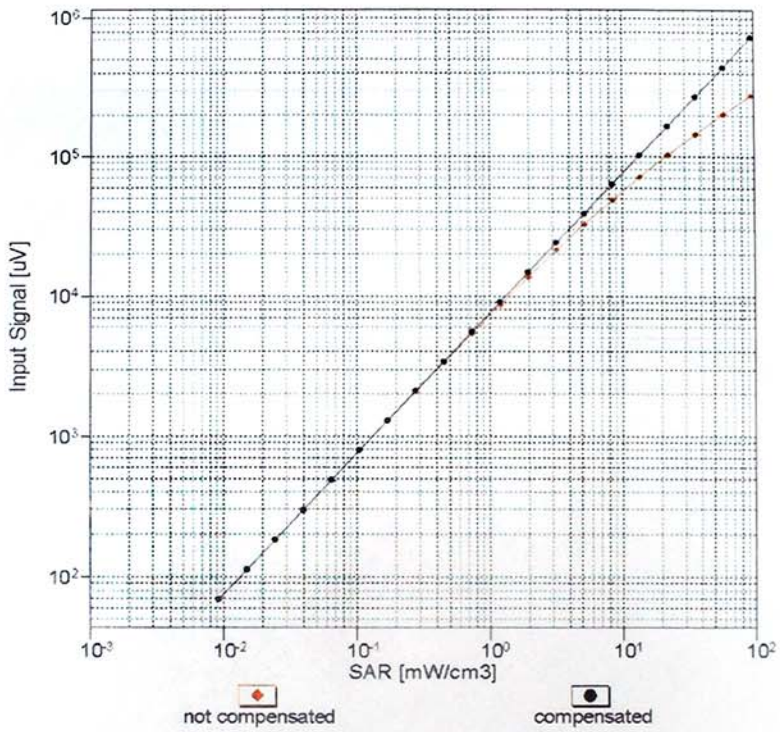
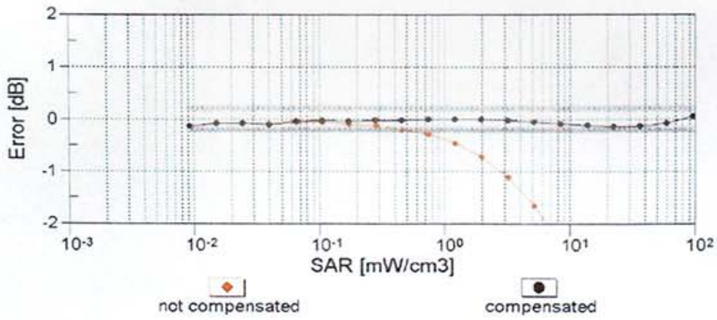
Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)





Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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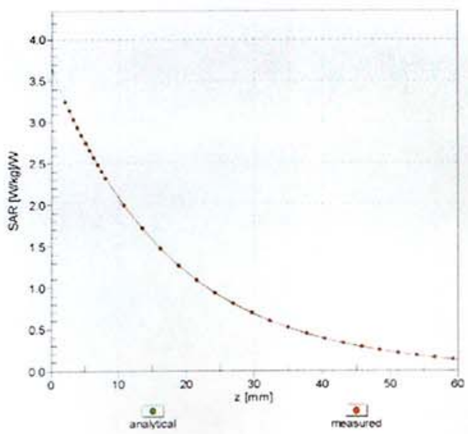
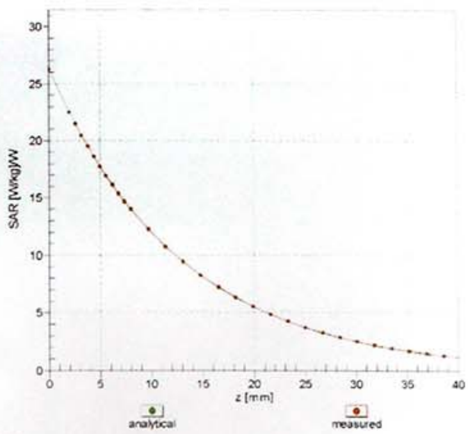
ES3DV3– SN:3292 August 15, 2015

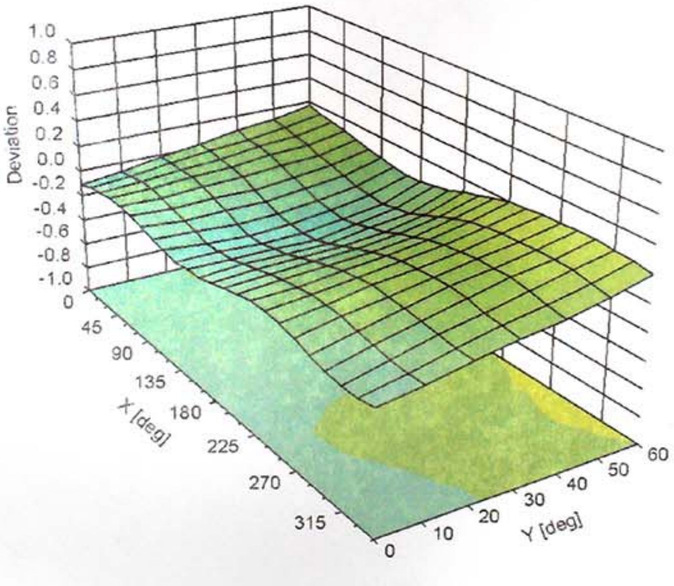
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-8.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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11.2 Probe Calibration Certificate D2450V2 (884)

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CALIBRATION No. L0570

Client 深圳出入境检验检疫局工业品检测技术中心机电实验室

Certificate No: Z15-97070

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 884
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits
Calibration date:	September 1, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	11-Sep-14 (TMC, No.JZ14-443)	Sep-15
Power sensor NRV-Z5	100595	11-Sep-14 (TMC, No. JZ14-443)	Sep -15
Reference Probe ES3DV3	SN 3149	5- Sep-14 (SPEAG, No.ES3-3149_Sep14)	Sep-15
DAE3	SN 536	23-Jan-15 (SPEAG, DAE3-536_Jan15)	Jan -16
Signal Generator E4438C	MY49070393	13-Nov-14 (TMC, No.JZ14-394)	Nov-15
Network Analyzer E8362B	MY43021135	19-Oct-14 (TMC, No.JZ14-278)	Oct-15

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

Issued: September 4, 2015

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CNAS CALIBRATION No. L0570

Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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CNAS CALIBRATION No. L0570

Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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	40.2 ± 6 %	1.84 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	13.1 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**52.1 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.3 ± 6 %	2.00 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.1 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**51.6 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.11 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.2 mW /g ± 20.4 % (k=2)**

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CALIBRATION
No. L0570

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	58.3Ω- 0.76jΩ
Return Loss	- 22.3dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	58.1Ω+ 2.61jΩ
Return Loss	- 22.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.224 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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CALIBRATION No. L0570

DASY5 Validation Report for Head TSL Date: 01.09.2015

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 884

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

Medium parameters used: f = 2450 MHz; σ = 1.84 S/m; ε_r = 40.2; ρ = 1000 kg/m^3

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.48, 4.48, 4.48); Calibrated: 2014-09-05;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2015-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

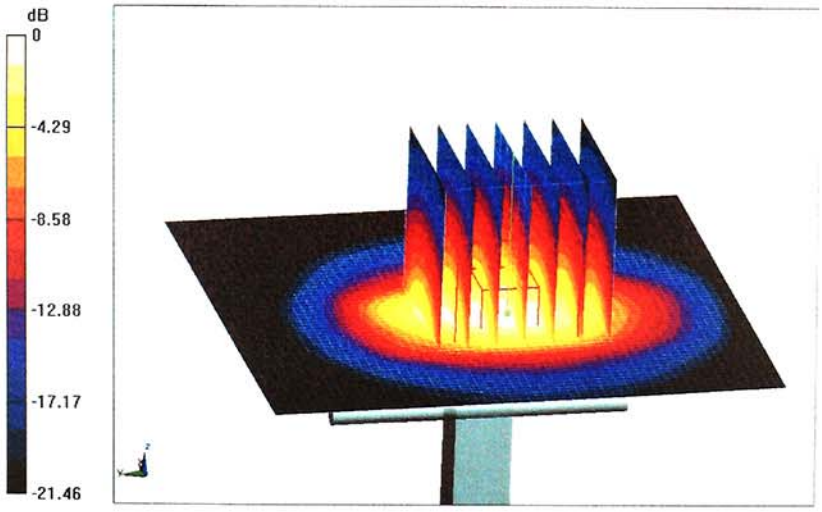
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.491 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 26.6 W/kg

SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.17 W/kg

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



0 dB = 17.1 W/kg = 12.33 dBW/kg

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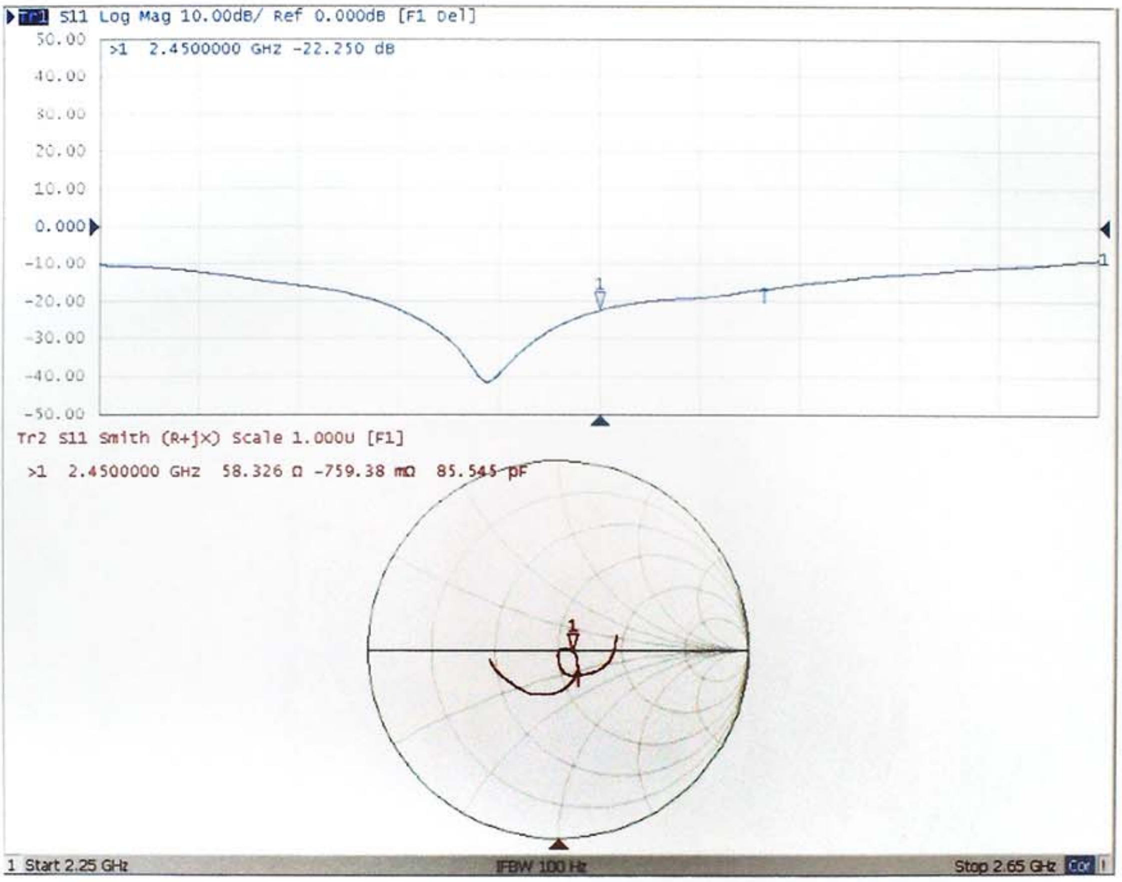
Impedance Measurement Plot for Head TSL



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

CALIBRATION
No. L0570

DASY5 Validation Report for Body TSL Date: 01.09.2015

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 884

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

Medium parameters used: f = 2450 MHz; σ = 1.988 S/m; ε_r = 51.25; ρ = 1000 kg/m^3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.21, 4.21, 4.21); Calibrated: 2014-09-03;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2015-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/2
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

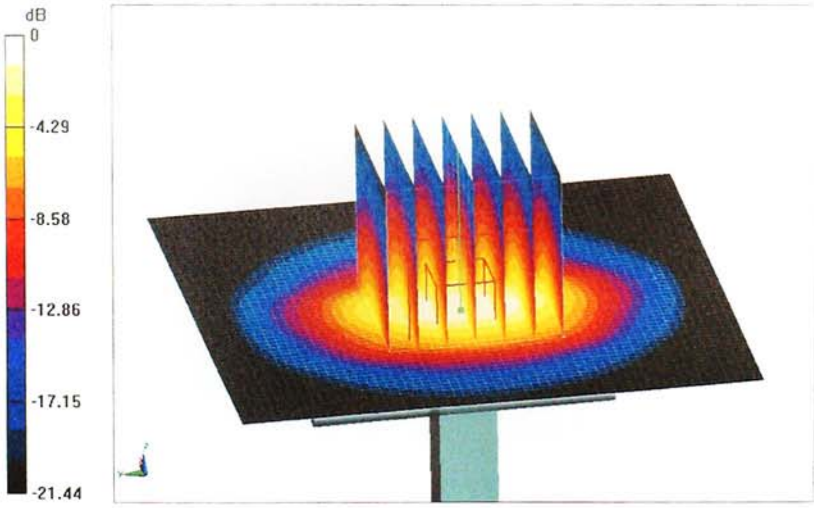
System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.180 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 27.6 W/kg

SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.11 W/kg

Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

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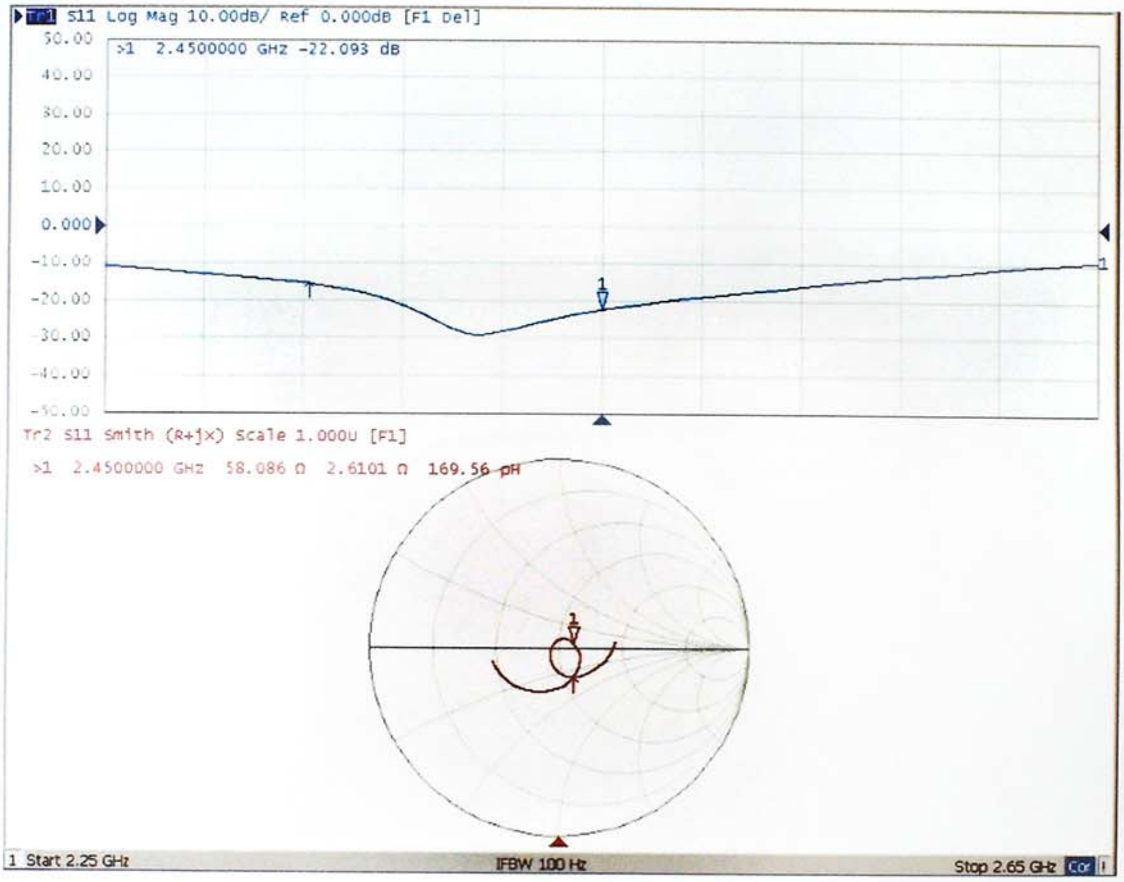
CALIBRATION No. L0570

Impedance Measurement Plot for Body TSL



11.3 DAE Calibration Certificate DAE4 (1315)

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CALIBRATION No. L0570

Client : 深圳出入境检验检疫局工业品检测技术中心机电实验室

Certificate No: Z15-97066

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1315
Calibration Procedure(s)	TMC-OS-E-01-198 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	July 22, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Documenting Process Calibrator 753	1971018	01-July-15 (CTTL, No:J15X02147)	July-15

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

Issued: July 23, 2015

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CALIBRATION
No. L0570

Glossary:

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

Methods Applied and Interpretation of Parameters:

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

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CALIBRATION No. L0570

DC Voltage Measurement

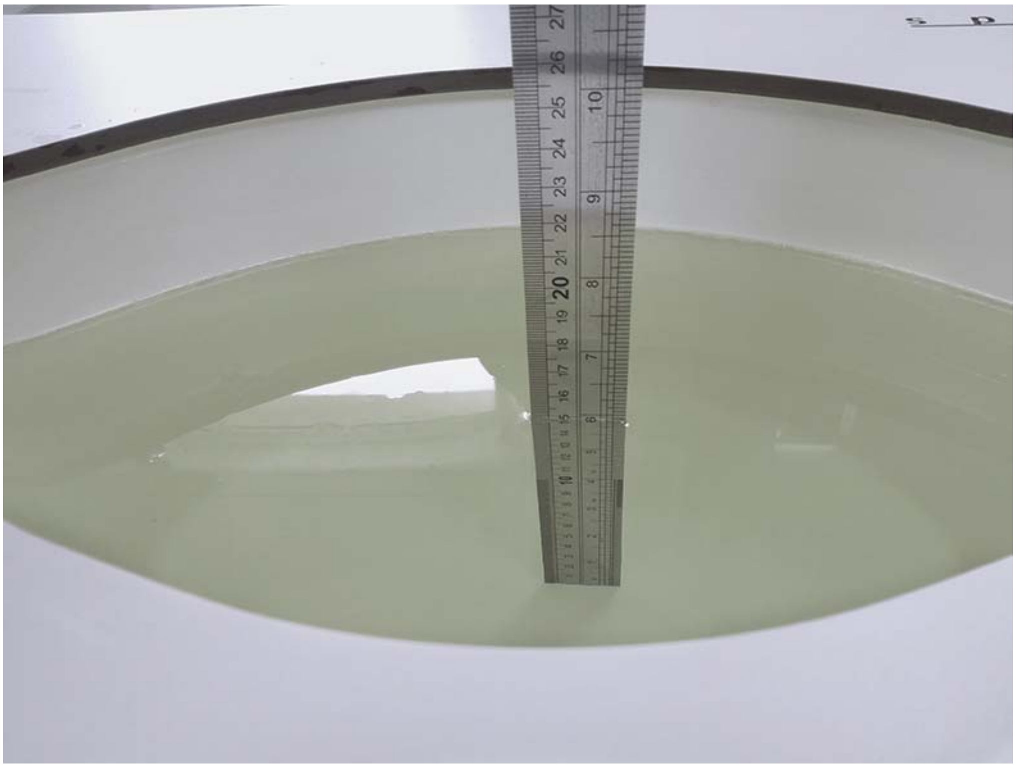
A/D - Converter Resolution nominal
High Range: 1LSB = 6.1μV , full range = -100…+300 mV
Low Range: 1LSB = 61nV , full range = -1…….+3mV
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	405.162 ± 0.15% (k=2)	405.006 ± 0.15% (k=2)	404.963 ± 0.15% (k=2)
Low Range	3.99072 ± 0.7% (k=2)	3.98481 ± 0.7% (k=2)	3.98836 ± 0.7% (k=2)

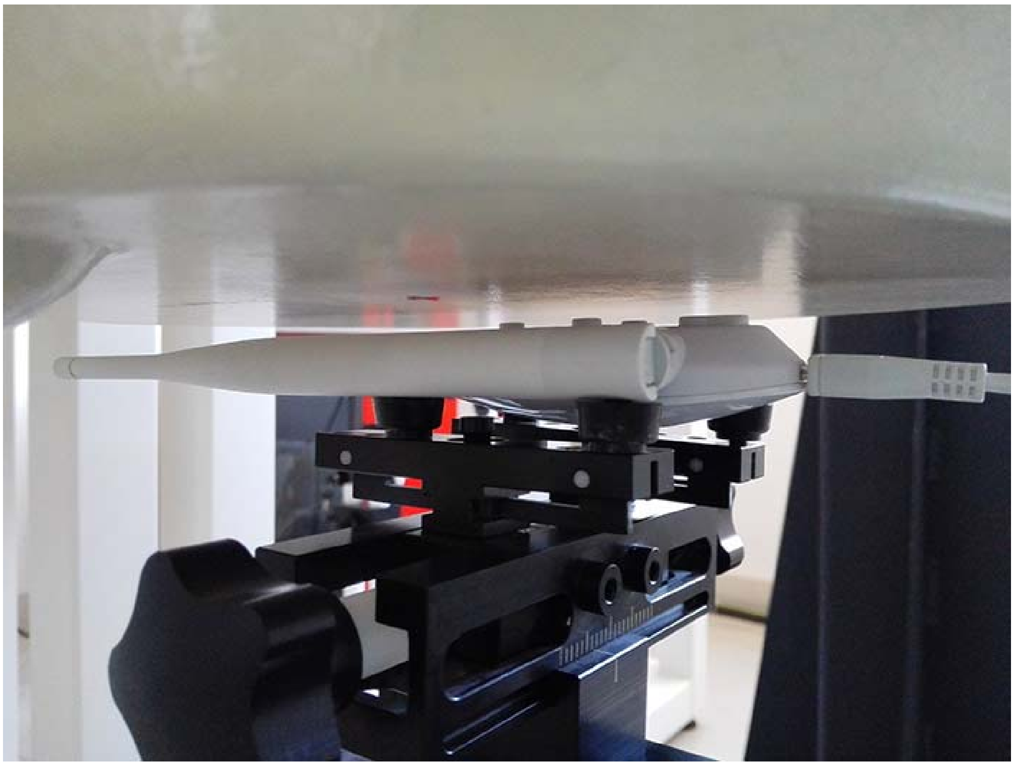
Connector Angle

Connector Angle to be used in DASY system	22° ± 1 °

12. EUT TEST PHOTO



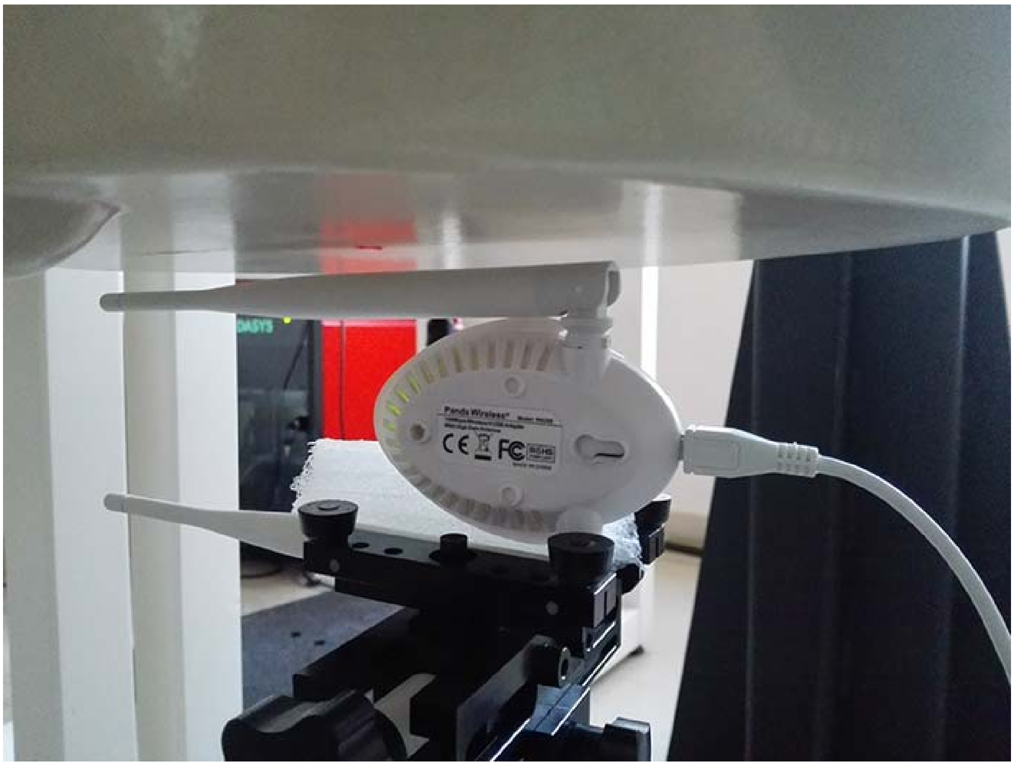
Liquid depth in the flat Phantom (2450 MHz, 15.1cm depth)



Horizontal Up Position Setup Photo

Horizontal Down Position Setup Photo

Horizontal Up Position with the antennas bent at 90 degrees perpendicular to the phantom (antennas pointing down and away from the phantom) Setup Photo



Vertical Front Position Setup Photo

13. PHOTOGRAPHS OF EUT CONSTRUCTIONAL

Reference to the test report No. GTI20150270F-1

************************THE END************************