FCC SAR Test Report

FCC ID: SIB-BGTAB-NV24A-1

Project No.	:	1411C077
Equipment	:	dreamtab
Model Name	:	BGTAB-NV24A
Applicant	:	Foxconn International Inc
Address	:	NO 2 ZIYOU ST TUCHENG DISTRICT NEW TAIPEI,236 Taiwan

Date of Receipt	:	Nov. 10, 2014
Date of Test	:	Nov. 10, 2014 ~ Nov. 25, 2014
Issued Date	:	Nov. 27, 2014
Tested by	:	BTL Inc.

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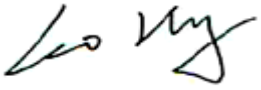
Technical Manager : 

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REPORT ISSUED HISTORY

Issued No.	Description	Issued Date
BTL-FCC-SAR-1411C077	Original Issue.	Nov. 27, 2014

1. GENERAL SUMMARY

Equipment	dreamtab
Brand Name	Nabi
Model Name	BGTAB-NV24A
Model Difference	N/A
Manufacturer	FUHU INC
Address	909N., Sepulveda Blvd., Suite 540, E1 Segundo, CA 90245
Factory	HONGFUJIN Precision Electronics (Chong Qing) Co., Ltd.
Address	No.1, 1st E District RD., Shapingba District, Chongqing 401332, P.R. China
Standard(s)	**FCC 47CFR §2.1093** Radio frequency Radiation Exposure Evaluation: Portable Devices **ANSI C95.1, 1999** Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.(IEEE Std C95.1-1999) **KDB 616217 D04 SAR for laptop and tablets v01r01:**SAR Evaluation Considerations for Laptop, Notebook and Tablet Computers **KDB 248227 D01 v01r02 SAR meas for 802 11 a b g v01r02:** SAR Measurement Procedures for 802.11a/b/g Transmitters **KDB 447498 D01 General RF Exposure Guidance v05r02**: Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies. **KDB 865664 D01 SAR measurement 100 MHz to 6GHz v01r03:** SAR Measurement Requirements for 100MHz to 6GHz

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.
The test data, data evaluation, and equipment configuration contained in our test report (Ref No. BTL-FCC-SAR-1411C077) were obtained utilizing the test procedures, test instruments, test sites that has been accredited by the Authority of TAF according to the ISO-17025 quality assessment standard and technical standard(s).

2. RF EMISSIONS MEASUREMENT

2.1 TEST FACILITY

The test facilities used to collect the test data in this report is **SAR room** at the location of No.3,Jinshagang 1st Road, ShiXia, Dalang Town, Dong Guan, China.523792

2.2 MEASUREMENT UNCERTAINTY

Uncertainty Conponent	Uncertainty Value	Probability Distribution	Divisor	C_i (1g)	Standard Uncertainty ±1%	V_i or V_{eff}
Measurement System						
Probe Calibration (*k*=1)	5.9	Normal	1	1	5.9	∞
Axial Isotropy	4.7	Rectangular	$\sqrt{3}$	$\sqrt{0.5}$	1.9	∞
Hemispherical Isotropy	9.6	Rectangular	$\sqrt{3}$	$\sqrt{0.5}$	3.9	∞
Boundary Effect	1.0	Rectangular	$\sqrt{3}$	1	0.6	∞
Linearity	4.7	Rectangular	$\sqrt{3}$	1	2.7	∞
System Detection Limit	1.0	Rectangular	$\sqrt{3}$	1	0.6	∞
Readout Electronics	0.3	Normal	1	1	0.3	∞
Response Time	0.8	Rectangular	$\sqrt{3}$	1	0.5	∞
Integration Time	2.6	Rectangular	$\sqrt{3}$	1	1.5	∞
RF Ambient Conditions-Noise	3.0	Rectangular	$\sqrt{3}$	1	1.7	∞
RF Ambient Reflections	3.0	Rectangular	$\sqrt{3}$	1	1.7	∞
Probe Positioner Mechanical Tolerance	0.4	Rectangular	$\sqrt{3}$	1	0.2	∞
Probe Positioning with respect to Phantom Shell	2.9	Rectangular	$\sqrt{3}$	1	1.7	∞
Extrapolation, interpolation and integration Algorithms for Max. SAR Evaluation	1.0	Rectangular	$\sqrt{3}$	1	0.6	∞
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
Output Power Variation - SAR drift measurement	5.0	Rectangular	$\sqrt{3}$	1	2.9	∞
Phantom and Setup						
Phantom Uncertainty (shape and thickness tolerances)	4.0	Rectangular	$\sqrt{3}$	1	2.3	∞
Liquid Conductivity - deviation from target values	5.0	Rectangular	$\sqrt{3}$	0.64	1.8	∞
Liquid Conductivity - measurement uncertainty	2.5	Normal	1	0.64	1.6	∞
Liquid Permittivity - deviation from target values	5.0	Rectangular	$\sqrt{3}$	0.6	1.7	∞
Liquid Permittivity - measurement uncertainty	2.5	Normal	1	0.6	1.5	∞
Combined standard uncertainty		RSS	-	-	10.9	387
Expanded uncertainty		*k*=2	-	-	21.9	-

3. GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

Tested Mode(s)	Bluetooth; WiFi (802.11a/b/g/n)	
Operation Frequency	Mode	Frequency
	WIFI	2412MHz~2462 MHz 5180MHz~5240MHz 5260MHz~5320MHz 5500 MHz~5700MHz 5745 MHz~5825MHz
	Bluetooth	2402 MHz ~2480 MHz
Modulation Technology Bit Rate of Transmitter	Bluetooth	GFSK(1Mbps) π /4 DQPSK(2Mbps) 8DPSK(3Mbps)
	WIFI	802.11a (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11b (DSSS, CCK) 1, 2, 5.5, 11 Mbps 802.11g (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n (OFDM, MCS 0-15) 6.5, 7.2, 13.0, 14.4, 19.5, 21.7,26.0, 28.9, 39.0, 43.3, 52.0, 57.8, 58.5, 65.0, 72.2 up to 300Mbps
Number Of Channel	Please refer to note 1(WIFI) Please refer to note 2(BT)	
Antenna Type	Please refer to note 3	
Power Source	#1 DC supplied from AC Adapter. Model: ADS-65LSI-19-3 19065G #2 Supplied from rechargeable Li-ion polymer battery. Brand / Model: McNair / MLP2462113-2S	
Power Rating	#1 I/P AC 100-240V~ 50/60Hz 1.5A O/P: DC 19V 3.42A #2 7.4V 1650mAh 12.21Wh	

Note:

1. Number Of Channel(WIFI)

802.11b / g / n 20MHz / n 40MHz							
CH 01 – CH 11 for 802.11b, 802.11g, 802.11n(20MHz) CH 03 – CH 09 for 802.11n(40MHz)							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2412	04	2427	07	2442	10	2457
02	2417	05	2432	08	2447	11	2462
03	2422	06	2437	09	2452		

802.11a / 802.11n 20MHz				802.11n 40MHz			
Band 1		Band 2		Band 1		Band 2	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
36	5180	52	5260	38	5190	54	5270
40	5200	56	5280	46	5230	62	5310
44	5220	60	5300				
48	5240	64	5320				

802.11a / 802.11n 20MHz					
Band 3				Band 4	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
100	5500	124	5620	149	5745
104	5520	128	5640	153	5765
108	5540	132	5660	157	5785
112	5560	136	5680	161	5805
116	5580	140	5700	165	5825
120	5600				

802.11n 40MHz					
Band 3				Band 4	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
102	5510	126	5630	151	5755
110	5550	134	5670	159	5795
118	5590				

2. Number Of Channel(BT)

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	2402	27	2429	54	2456
01	2403	28	2430	55	2457
02	2404	29	2431	56	2458
03	2405	30	2432	57	2459
04	2406	31	2433	58	2460
05	2407	32	2434	59	2461
06	2408	33	2435	60	2462
07	2409	34	2436	61	2463
08	2410	35	2437	62	2464
09	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

Note: BT 4.0 has 40 channels, 2 MHz bandwidth.

3. Table for Filed Antenna

The product has 2 group antenna: MAG and FOXCONN .

Group 1

Ant.	Manufacturer	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	FOXCONN	PCA-3007-25GC1-A2	Integral	N/A	-3.31	2.4G (360mm)
1	FOXCONN	PCA-3007-25GC1-A2	Integral	N/A	-1.31	5G (360mm)
2	FOXCONN	PCA-3007-25GC1-A5	Integral	N/A	-4.52	2.4G (65mm)
2	FOXCONN	PCA-3007-25GC1-A5	Integral	N/A	-3.46	5G (65mm)

Group 2

Ant.	Manufacturer	Model Name	Antenna Type	Connector	Gain (dBi)	Note
1	MAG Corporation	PCA-3007-25GC1-A2	Integral	N/A	0. 20	2.4G (360mm)
1	MAG Corporation	PCA-3007-25GC1-A2	Integral	N/A	2.24	5G (360mm)
2	MAG Corporation	PCA-3007-25GC1-A5	Integral	N/A	-0.93	2.4G (65mm)
2	MAG Corporation	PCA-3007-25GC1-A5	Integral	N/A	1.92	5G (65mm)

Note:

1.The EUT incorporates a MIMO function. Physically, the EUT provides two completed two transmitters and two receivers (2T2R).

2. Two groups of antenna used with the same type, only differ in manufacturer and gain, group 2 is tested and recorded as the worst case in this report.

3.

Operating Mode / TX Mode	1TX	2TX
802.11a	ANT 2	
802.11b	ANT 2	-
802.11g	ANT 2	-
802.11n(20MHz)	-	(ANT 1 + ANT 2)
802.11n(40MHz)	-	(ANT 1 + ANT 2)

3.2 THE MAXIMUM SAR1G VALUES

Body SAR Configuration

Test Mode	Frequency (MHz)	Test Position	Separation Distance	Reported Result SAR_{1g} (W/kg)	Limit SAR_{1g} (W/kg)
802.11a Band3	5580	Test Position 1	0mm	0.336	1.6

3.3 LABORATORY ENVIRONMENT

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

3.4 MAIN TEST INSTRUMENTS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Data Acquisition Electronics	Speag	DAE4	1390	Sep. 15, 2015
2	E-field Probe	Speag	EX3DV4	3898	Mar. 10, 2015
3	Electro Optical Converter	Speag	ECO90	1151	N/A
4	ELI4 Phantom	Speag	ELI4 Phantom V5.0	1222	N/A
5	System Validation Dipole	Speag	D2450V2	919	Sep. 17, 2015
6	Power Amplifier	Speag	ZHL-42W	N/A	N/A
7	Power Amplifier	Speag	ZVE-8G	N/A	N/A
8	ENA Network Analyzer	Agilent	E5071C	MY46102965	Mar. 29, 2015
9	Dielectric Probe Kit	Agilent	85070E	2593	N/A
10	P-series power meter	Agilent	N1911A	MY45100473	Mar. 29, 2015
11	wideband power sensor	Agilent	N1921A	MY51100041	Mar. 29, 2015
12	Power Meter	Anritsu	ML2487A	6K00004714	Mar. 16, 2015
13	Power Meter Sensor	Anritsu	MA2491A	34138	Mar. 16, 2015
14	MXG Analog Signal Generator	Agilent	N5181A	MY49060710	Nov. 02, 2015
15	System Validation Dipole	Speag	D5GHzV2	1160	Nov. 04, 2015
16	Low pass filter	Mini-Circuits	SLP-2950+	M108294	Mar. 29, 2015
17	Attenuator	Mini-Circuits	VAT-10+	31317-1	Mar. 29, 2015
18	Attenuator	Mini-Circuits	VAT-10+	31317-2	Mar. 29, 2015
19	Attenuator	MEB	300-affn-03	314	Mar. 29, 2015
20	Dual directional coupler	Agilent	777D	50208	Mar. 29, 2015

Remark: ” N/A” denotes no model name, serial No. or calibration specified.
All calibration period of equipment list is one year.

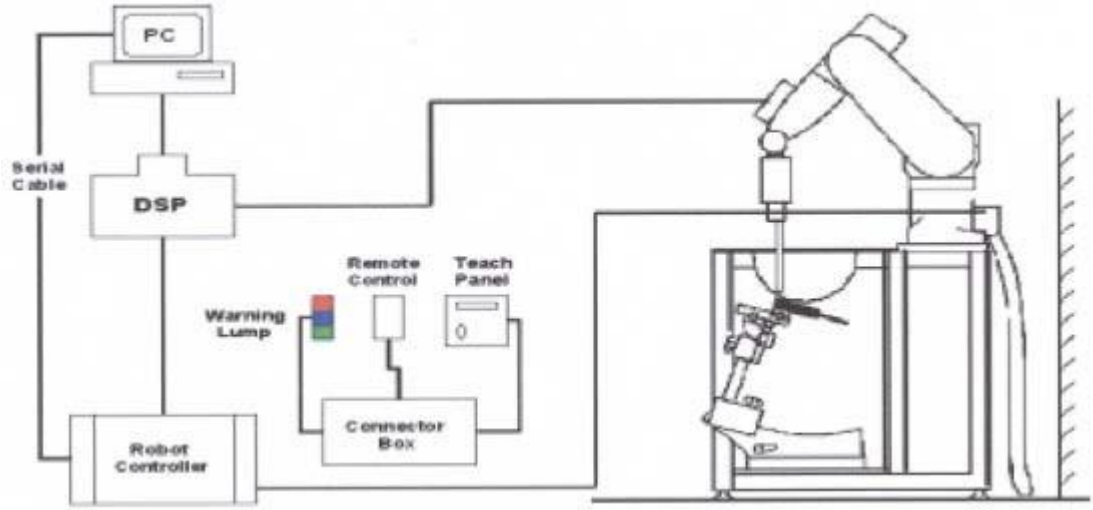
4. SAR MEASUREMENTS SYSTEM CONFIGURATION

4.1 SAR MEASUREMENT SET-UP

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

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
2. 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.
3. 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.
4. A unit to operate the optical surface detector which is connected to the EOC.
5. 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.
6. 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 7
7. DASY5 software and SEMCAD data evaluation software.
8. Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling the testing of left-hand and right-hand usage.
10. The device holder for handheld mobile phones.
11. Tissue simulating liquid mixed according to the given recipes.
12. System validation dipoles allowing to validate the proper functioning of the system.

4.1.1 TEST SETUP LAYOUT



4.2 DASY5 E-FIELD PROBE SYSTEM

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

4.2.1 EX3DV4 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 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Distance from probe tip to dipole centers: 1.0 mm

EX3DV4 E-field Probe

4.2.2 E-FIELD PROBE CALIBRATION

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

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

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

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where: Δt = Exposure time (30 seconds),

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

ΔT = Temperature increase due to RF exposure.

Or $$SAR = \frac{|E|^2 \sigma}{\rho}$$

Where: σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m3).

4.2.3 OTHER TEST EQUIPMENT

4.2.3.1. Device Holder for Transmitters

Construction: Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices (e.g., laptops, cameras, etc.) It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner. The extension is fully compatible with the Twin SAM, ELI4 and SAM v6.0 Phantoms.
Material: POM, Acrylic glass, Foam

4.2.3.2 Phantom

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible all known tissuesimulating liquids. ELI 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 compatible with all SPEAG dosimetric probes and dipoles.

Shell Thickness	2±0.1 mm
Filling Volume	Approx. 30 liters
Dimensions	190 X 600 X 0 mm (H x L x W)
Aailable	Special

ELI4 Phantom

4.2.4 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°.)

- Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot.Before starting the area scan a grid spacing of 10 mm x 10 mm is set. During the scan the distance of the probe to the phantom remains unchanged. After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

- Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

- Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses.The DASY5 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 maxima 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 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 Zoom 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 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

4.2.5 DATA STORAGE AND EVALUATION

4.2.5.1 Data Storage

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

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

4.4.2 Data Evaluation by SEMCAD

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

Probe parameters:	Sensitivity	Normi, 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	
	Density	

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

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

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 parameter)

dcp_i = diode compression point (DASY parameter)

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

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

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

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

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)^2] for E-field Probes

ConvF = sensitivity enhancement in solution

aij = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

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

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

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

$$E_{tot} = (E_X^2 + E_Y^2 + E_Z^2)^{1/2}$$

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

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

With SAR = local specific absorption rate in mW/g

E_{tot} = total field strength in V/m
= conductivity in [mho/m] or [Siemens/m]
= equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

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

With P_{pwe} = equivalent power density of a plane wave in mW/cm^2

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

H_{tot} = total magnetic field strength in A/m

5. TISSUE-EQUIVALENT LIQUID

5.1 TISSUE-EQUIVALENT LIQUID INGREDIENTS

The liquid is consisted of water, salt and Glycol. The liquid has previously been proven to be suited for worst-case. The Table 2 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed

Composition of the body Tissue Equivalent Matter

MIXTURE%	FREQUENCY 2450MHz
Water	73.2
Glycol	26.7
Salt	0.1
Dielectric Parameters Target Value	f=2450MHzε=52.70 σ=1.95

Simulating Liquids for 5GHz, Manufactured by SPEAG

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

5.2 TISSUE-EQUIVALENT LIQUID PROPERTIES

Dielectric Performance of Tissue Simulating Liquid

Frequency (MHz)	Description	Dielectric Parameters		Temp ℃
		ε_r	σ(s/m)	
2450	Target value ±5% within	52.70 50.07-55.34	1.95 1.85-2.048	22.0
	Measurement value **2014-11-19**	**51.92**	**1.97**	**20.8**
5200	Target value ±5% within	49.00 46.55~51.45	5.30 5.04~5.57	22.0
	Measurement value **2014-11-20**	**48.50**	**5.39**	**21.2**
5300	Target value ±5% within	48.90 46.46~51.35	5.42 5.15~6.69	22.0
	Measurement value **2014-11-20**	**49.30**	**5.55**	**21.2**
5500	Target value ±5% within	48.60 46.17~51.03	5.65 5.37~5.93	22.0
	Measurement value **2014-11-20**	**48.50**	**5.75**	**21.2**
5800	Target value ±5% within	48.20 45.79~50.61	6.00 5.70~6.30	22.0
	Measurement value **2014-11-20**	**47.90**	**6.22**	**21.2**

6. SYSTEM CHECK

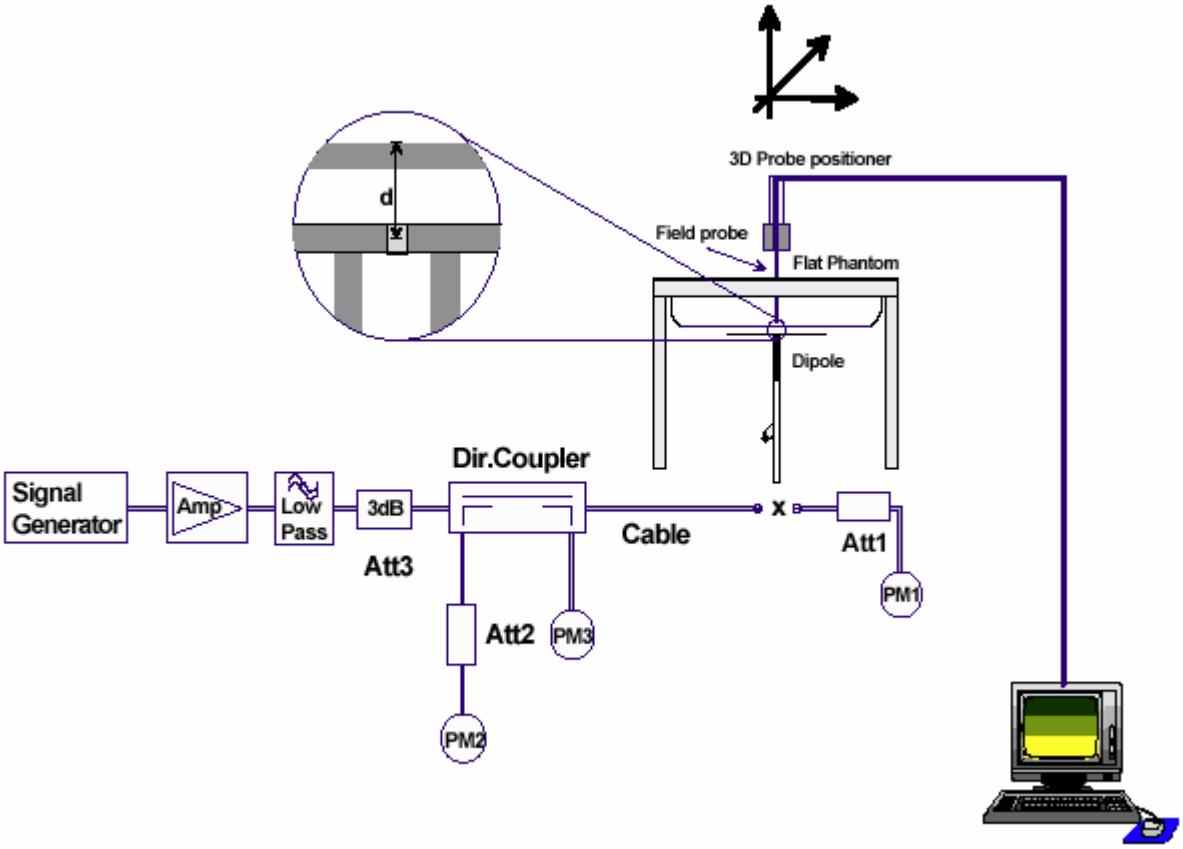
6.1 DESCRIPTION OF SYSTEM CHECK

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the 6.2.

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.

System Check Set-up



6.2 DESCRIPTION OF SYSTEM CHECK

System Check in Tissue Simulating Liquid

Frequency (MHz)	Test Date	Dielectric Parameters		Temp	250mW Measured SAR_{1g}	1W Normalized SAR_{1g}	1W Target SAR_{1g} (±10% deviation)
		εr	σ(s/m)	(℃)	(W/kg)		
2450	2014-11-20	52.02	1.99	20.80	12.10	48.40	49.30 (44.37~54.23)

Frequency (MHz)	Test Date	Dielectric Parameters		Temp	100mW Measured SAR_{1g}	1W Normalized SAR_{1g}	1W Target SAR_{1g} (±10% deviation)
		εr	σ(s/m)	(℃)	(W/kg)		
5200	2014-11-22	48.5	5.39	21.20	7.21	72.1	74.00 (66.60~81.40)
5300	2014-11-22	49.3	5.55	21.20	7.41	74.1	75.7 (68.13~83.27)
5500	2014-11-22	48.5	5.75	21.20	7.67	76.7	78.4 (70.56~86.24)
5600	2014-11-22	48.09	5.91	21.20	7.95	79.5	78.9 (71.01~86.79)
5800	2014-11-22	47.9	6.22	21.20	6.88	68.8	72.50 (65.25~79.75)

Note: 1. The graph results see Appendix 2.
2. Target Value derives from the calibration certificate

7. OPERATIONAL CONDITIONS DURING TEST

7.1 GENERAL DESCRIPTION OF TEST PROCEDURES

For WLAN SAR testing, WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement has almost 100% duty cycle and its crest factor is 1.

For the 802.11b/g/n SAR tests, a communication link is set up with the test mode software for WIFI mode test. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode. Each channel should be tested at the lowest data rate. Testing at higher data rates is not required when the maximum average output power is less than 0.25dB higher than those measured at the lowest data rate.

802.11b/g operating modes are tested independently according to the service requirements in each frequency band.802.11b/g modes are tested on channels1,6,11; however, if output power reduction is necessary for channels 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels must be tested instead.

SAR is not required for 802.11g/n channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels.

KDB 248227 - SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels.

7.2 Test Position

The overall diagonal dimension of the display section of a tablet is 69.8cm>20cm,Per FCC KDB 616217,the back surface and edges of the tablet should be tested for SAR compliance with the Tablet touching the phantom.SAR evaluation for the front surface of tablet display screens are generally not necessary. The SAR Exclusion Threshold in KDB 447498 D01can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned adjacent the phantom and the edge containing the antenna positioned perpendicular to the phantom.

7.2.2 SAR test reduction and exclusion guidance

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

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

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

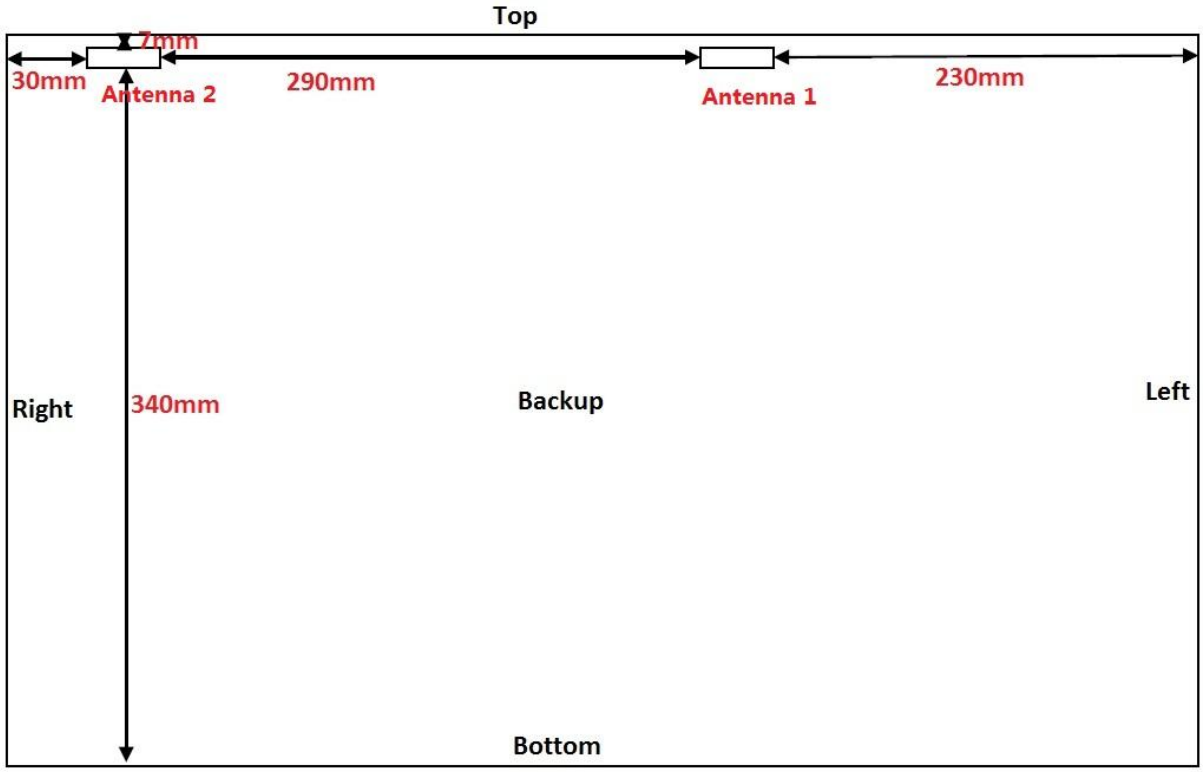
a) at 100 MHz to1500 MHz

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

b) at >1500MHz and ≤6GHz

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

The location of the antenna inside EUT is shown in APPENDIX 7.



- **Test Position 1:** The top side of the EUT towards the bottom of the flat phantom. The distance between the top side of the EUT and the bottom of the flat phantom is 0mm. (APPENDIX 7)

  SAR is not required for BT antenna in this position.

  SAR is required for WiFi antenna in this position.

  $Evaluation_{(BT)}=[10^{(7.5/10)}/7]*(2.480^{1/2})=1.27<3.0$

  $Evaluation_{(2.4GWiFi)}=[10^{(16.5/10)}/7]*(2.462^{1/2})=10.01>3.0$

  $Evaluation_{(5GWiFi)}=[10^{(14.5/10)}/7]*(5.825^{1/2})=9.7>3.0$

- **Test Position 2:** The back side of the EUT towards the bottom of the flat phantom. The distance between the back side of the EUT and the bottom of the flat phantom is 0mm. (APPENDIX 7)

  SAR is not required for BT antenna in this position.

  SAR is required for WiFi antenna in this position.

  $Evaluation_{(BT)}=[10^{(7.5/10)}/5]*(2.480^{1/2})=1.77<3.0$

  $Evaluation_{(2.4GWiFi)}=[10^{(16.5/10)}/5]*(2.462^{1/2})=14.02>3.0$

  $Evaluation_{(5GWiFi)}=[10^{(14.5/10)}/5]*(5.825^{1/2})=13.60>3.0$

- **Test Position 3:** The bottom side of the EUT towards the bottom of the flat phantom. The distance between the bottom side of the EUT and the bottom of the flat phantom is 0mm.

  SAR is not required for BT & WiFi antenna in this position.

  $Evaluation_{(BT)}$= 95.3+(340-50)*10 =2995.3mW=34.8dBm>7.5dBm(max.power)

  $Evaluation_{(2.4GWiFi)}$= 95.6+(340-50)*10 =2995.6mW=34.8dBm>16.5dBm(max.power)

  $Evaluation_{(5GWiFi)}$= 62.2+(340-50)*10 =2962.2mW=34.7dBm>14.5dBm(max.power)

- **Test Position 4:** The front side of the EUT towards the bottom of the flat phantom. The distance between the front side of the EUT and the bottom of the flat phantom is 0mm.

  SAR is not required for this position.

- **Test Position 5:** The left side of the EUT towards the bottom of the flat phantom. The distance between the left side of the EUT and the bottom of the flat phantom is 0mm.

  SAR is not required for BT & WiFi antenna in this position.

  $Evaluation_{(BT)}$= 95.3+(580-50)*10 =5395.3mW=37.3dBm>7.5dBm(max.power)

  $Evaluation_{(2.4GWiFi)}$= 95.6+(580-50)*10 =5395.6mW=37.3dBm>16.5dBm(max.power)

  $Evaluation_{(5GWiFi)}$= 62.2+(580-50)*10 =5362.2mW=37.3dBm>14.5dBm(max.power)

- **Test Position 6:** The right side of the EUT towards the bottom of the flat phantom. The distance between the right side of the EUT and the bottom of the flat phantom is 0mm.

  SAR is not required for BT & WiFi antenna in this position.

  $Evaluation_{(BT)}=[10^{(7.5/10)}/30]*(2.480^{1/2})=0.30<3.0$

  $Evaluation_{(2.4GWiFi)}=[10^{(16.5/10)}/30]*(2.462^{1/2})=2.34<3.0$

  $Evaluation_{(5GWiFi)}=[10^{(14.5/10)}/30]*(5.825^{1/2})=2.27<3.0$

8. TEST RESULT

8.1 CONDUCTED POWER RESULTS

The average output power of BT antenna is as following:

Channel	Ch0	Ch39	Ch78
GFSK(dBm)	-1.26	-1.72	-1.94
EDR 3M-8DPSK(dBm)	-2.39	-3.09	-3.27
BT LE	**Ch0**	**Ch19**	**Ch39**
GFSK(dBm)	3.13	3.76	4.03

The average output power of WiFi antenna is as following:

WiFi 2.4G	Ant	Data Rate (Mbps) / Frequency (MHz)	Test Results (dBm)							
			Conducted AV							
			1	2	5.5	11				
802.11b	Ant 2	2412	15.79	15.75	15.72	15.68				
		2437	15.75	15.71	15.67	15.64				
		2462	14.68	15.64	15.59	15.55				

WiFi 2.4G	Ant	Data Rate (Mbps) / Frequency (MHz)	Test Results (dBm)							
			Conducted AV							
			6	9	12	18	24	36	48	54
802.11g	Ant 2	2412	12.93	12.89	12.86	12.83	12.79	12.75	12.72	12.69
		2437	13.96	13.92	13.89	13.85	13.81	13.78	13.74	13.69
		2462	13.04	12.99	12.95	12.91	12.89	12.85	12.81	12.78

WiFi 2.4G	Ant	Data Rate (Mbps) / Frequency (MHz)	Test Results (dBm)							
			Conducted AV							
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
802.11n HT20 (SISO)	Ant 2	2412	11.18	11.13	11.11	11.06	11.02	10.97	10.95	10.92
		2437	13.15	13.1	13.06	13.03	12.89	12.86	12.82	12.78
		2462	11.93	11.89	11.85	11.83	11.79	11.76	11.72	11.69

WiFi 2.4G	Ant	Data Rates / Frequency (MHz)	Average Power (dBm)							
			MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
802.11n HT20 (MIMO)	Ant 2	2412	10.89	10.85	10.82	10.78	10.75	10.73	10.69	10.62
		2437	12.74	12.71	12.67	12.64	12.61	12.57	12.54	12.52
		2462	11.66	11.62	11.58	11.53	11.49	11.44	11.38	11.35
	Ant 1	2412	10.68	10.64	10.59	10.55	10.52	10.48	10.45	10.41
		2437	12.44	12.39	12.35	12.32	12.29	12.25	12.22	12.18
		2462	11.45	11.42	11.38	11.33	11.31	11.27	11.22	11.18
	Sum	2412	13.80	13.76	13.72	13.68	13.65	13.62	13.58	13.53
		2437	15.60	15.56	15.52	15.49	15.46	15.42	15.39	15.36
		2462	14.57	14.53	14.49	14.44	14.41	14.37	14.31	14.28

WiFi 2.4G	Ant	Data Rate (Mbps) / Frequency (MHz)	Test Results (dBm)							
			Conducted AV							
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
802.11n HT40 (SISO)	Ant 2	2422	7.53	7.49	7.46	7.41	7.37	7.34	7.31	7.27
		2437	8.94	8.89	8.87	8.83	8.79	8.77	8.72	8.68
		2452	7.81	7.78	7.75	7.71	7.68	7.64	7.61	7.56

WiFi 2.4G	Ant	Data Rates / Frequency (MHz)	Average Power (dBm)							
			MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
802.11n HT40 (MIMO)	Ant 2	2422	7.23	7.18	7.15	7.12	7.09	7.05	6.02	6.98
		2437	8.65	8.61	8.58	8.54	8.51	8.49	8.44	8.4
		2452	7.54	7.48	7.44	7.39	7.37	7.33	7.28	7.25
	Ant 1	2422	7.05	7.01	6.98	6.95	6.91	6.88	6.85	6.79
		2437	8.55	8.49	8.45	8.42	8.37	8.33	8.28	8.24
		2452	7.38	7.35	7.31	7.29	7.25	7.22	7.19	7.14
	Sum	2422	10.15	10.11	10.08	10.05	10.01	9.98	9.47	9.90
		2437	11.61	11.56	11.53	11.49	11.45	11.42	11.37	11.33
		2452	10.47	10.43	10.39	10.35	10.32	10.29	10.25	10.21

WiFi 5G	Ant	Data Rate (Mbps) / Frequency (MHz)	Test Results (dBm)							
			Conducted AV							
			6	9	12	18	24	36	48	54
802.11a	Ant 2	5180	13.77	13.72	13.68	13.63	13.59	13.56	13.51	13.48
		5200	13.8	13.75	13.73	13.69	13.63	13.59	13.54	13.49
		5240	13.73	13.68	13.64	13.59	13.57	13.51	13.49	13.45
		5260	13.64	13.59	13.55	13.52	13.48	13.45	13.41	13.37
		5300	13.48	13.44	13.39	13.35	13.29	13.24	13.21	13.19
		5320	13.61	13.57	13.54	13.49	13.43	13.38	13.35	13.31
		5500	13.45	13.39	13.36	13.32	13.29	13.24	13.19	13.15
		5580	13.53	13.48	13.44	13.41	13.37	13.32	13.28	13.22
		5700	13.22	13.17	13.12	13.08	13.04	13.01	12.95	12.91
		5745	13.31	13.27	13.22	13.19	13.14	13.08	13.05	12.99
		5785	13.38	13.32	13.29	13.25	13.22	13.18	13.12	13.09
		5825	13.66	13.59	13.55	13.51	13.49	13.43	13.39	13.35

WiFi 5G	Ant	Data Rate (Mbps) / Frequency (MHz)	Test Results (dBm)							
			Conducted AV							
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
802.11n HT20 (SISO)	Ant 2	5180	13.07	13.02	12.96	12.92	12.89	12.87	12.85	12.82
		5200	13.11	13.06	13.02	12.97	12.94	12.92	12.89	12.87
		5240	12.93	12.89	12.86	12.83	12.81	12.78	12.76	12.71
		5260	12.99	12.96	12.93	12.89	12.86	12.82	12.79	12.76
		5300	12.77	12.73	12.69	12.67	12.64	12.62	12.59	12.56
		5320	12.86	12.82	12.79	12.77	12.72	12.71	12.67	12.65
		5500	12.65	12.58	12.53	12.49	12.47	12.45	12.41	12.39
		5580	12.82	12.78	12.74	12.71	12.67	12.62	12.59	12.55
		5700	11.33	11.29	11.25	11.18	11.14	11.1	11.07	11.03
		5745	12.52	12.48	12.45	12.41	12.36	12.32	12.29	12.25
		5785	12.78	12.74	12.72	12.68	12.65	12.62	12.58	12.53
		5825	13.17	13.13	13.08	13.03	12.97	12.92	12.87	12.84

WiFi 5G	Ant	Data Rates / Frequency (MHz)	Average Power (dBm)							
			MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
802.11n HT20 (MIMO)	Ant 2	**5180**	12.78	12.74	12.69	12.63	12.57	12.53	12.49	12.45
		5200	12.82	12.77	12.74	12.69	12.65	12.62	12.58	12.53
		5240	12.68	12.63	12.61	12.57	12.52	12.48	12.43	12.41
		5260	12.73	12.67	12.63	12.59	12.56	12.52	12.48	12.45
		5300	12.53	12.48	12.43	12.39	12.36	12.33	12.29	12.26
		5320	12.62	12.57	12.53	12.48	12.45	12.43	12.39	12.33
		5500	12.35	12.29	12.26	12.23	12.19	12.16	12.12	12.09
		5580	12.52	12.48	12.44	12.41	12.37	12.32	12.29	12.24
		5700	10.99	10.95	10.89	10.85	10.81	10.78	10.73	10.68
		5745	12.2	12.17	12.14	12.1	12.06	12.03	11.99	11.94
		5785	12.45	12.41	12.39	12.35	12.32	12.28	12.26	12.23
		5825	12.79	12.74	12.7	12.66	12.63	12.59	12.52	12.48
	Ant 1	**5180**	12.37	12.34	12.3	12.28	12.23	12.19	12.17	12.13
		5200	12.41	12.38	12.35	12.31	12.29	12.26	12.23	12.21
		5240	12.36	12.32	12.28	12.25	12.21	12.18	12.15	12.11
		5260	12.38	12.33	12.3	12.26	12.23	12.21	12.16	12.12
		5300	12.25	12.22	12.19	12.15	12.12	12.07	12.03	11.99
		5320	12.36	12.31	12.28	12.22	12.18	12.15	12.11	12.08
		5500	12.16	12.11	12.07	12.03	12.01	11.96	11.93	11.89
		5580	12.39	12.34	12.29	12.25	12.19	12.16	12.11	12.07
		5700	10.8	10.76	10.73	10.68	10.64	10.61	10.57	10.52
		5745	12.01	11.96	11.93	11.89	11.84	11.81	11.78	11.74
		5785	12.19	12.16	12.12	12.09	12.06	12.02	11.97	11.94
		5825	12.33	12.29	12.26	12.24	12.21	12.17	12.13	12.08
	Sum	**5180**	15.59	15.55	15.51	15.47	15.41	15.37	15.34	15.30
		5200	15.63	15.59	15.56	15.51	15.48	15.45	15.42	15.38
		5240	15.53	15.49	15.46	15.42	15.38	15.34	15.30	15.27
		5260	15.57	15.51	15.48	15.44	15.41	15.38	15.33	15.30
		5300	15.40	15.36	15.32	15.28	15.25	15.21	15.17	15.14
		5320	15.50	15.45	15.42	15.36	15.33	15.30	15.26	15.22
		5500	15.27	15.21	15.18	15.14	15.11	15.07	15.04	15.00
		5580	15.47	15.42	15.38	15.34	15.29	15.25	15.21	15.17
		5700	13.91	13.87	13.82	13.78	13.74	13.71	13.66	13.61
		5745	15.12	15.08	15.05	15.01	14.96	14.93	14.90	14.85
		5785	15.33	15.30	15.27	15.23	15.20	15.16	15.13	15.10
		5825	15.58	15.53	15.50	15.47	15.44	15.40	15.34	15.29

WiFi 5G	Ant	Data Rate (Mbps) / Frequency(MHz)	Average Power (dBm)							
			MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
802.11n HT40 (SISO)	Ant 2	5190	12.69	12.66	12.62	12.59	12.57	12.54	12.51	12.47
		5230	12.63	12.56	12.52	12.49	12.44	12.42	12.38	12.35
		5270	12.51	12.47	12.43	12.41	12.38	12.36	12.33	12.29
		5310	12.51	12.46	12.43	12.39	12.36	12.33	12.26	12.22
		5510	13.02	12.99	12.96	12.93	12.89	12.86	12.83	12.79
		5670	12.81	12.77	12.73	12.69	12.66	12.61	12.58	12.53
		5755	13.09	13.04	13.01	12.97	12.93	12.89	12.85	12.81
		5795	13.43	13.39	12.35	12.31	12.28	12.25	12.22	12.19

WiFi 5G	Ant	Data Rates / Frequency(MHz)	Average Power (dBm)							
			MCS8	MCS9	MCS10	MCS11	MCS12	MCS13	MCS14	MCS15
802.11n HT40 (MIMO)	Ant 2	5190	12.44	12.39	12.34	12.29	12.25	12.21	12.17	12.15
		5230	12.32	12.28	12.25	12.19	12.14	12.11	12.08	12.03
		5270	12.26	12.22	12.19	12.15	12.12	12.08	12.03	11.97
		5310	12.17	12.14	12.11	12.07	12.04	12.02	11.98	11.95
		5510	12.76	12.71	12.66	12.63	12.58	12.54	12.49	12.44
		5670	12.52	12.49	12.46	12.41	12.38	12.34	12.31	12.29
		5755	12.77	12.72	12.68	12.63	12.58	12.55	12.5	12.48
		5795	12.16	12.12	11.98	11.95	11.91	11.86	11.83	11.78
	Ant 1	5190	12.04	11.99	11.96	11.92	11.89	11.85	11.81	11.78
		5230	12	11.96	11.93	11.89	11.84	11.81	11.77	11.72
		5270	12.03	11.98	11.94	11.91	11.88	11.84	11.81	11.79
		5310	11.95	11.9	11.87	11.84	11.81	11.78	11.73	11.68
		5510	12.04	12	11.97	11.95	11.91	11.87	11.84	11.81
		5670	12.23	12.18	12.14	12.1	12.06	12.03	11.99	11.96
		5755	12.18	12.13	12.09	12.05	12.03	11.99	11.95	11.93
		5795	11.96	11.91	11.88	11.83	11.78	11.74	11.69	11.65
	Sum	5190	15.25	15.20	15.16	15.12	15.08	15.04	15.00	14.98
		5230	15.17	15.13	15.10	15.05	15.00	14.97	14.94	14.89
		5270	15.16	15.11	15.08	15.04	15.01	14.97	14.93	14.89
		5310	15.07	15.03	15.00	14.97	14.94	14.91	14.87	14.83
		5510	15.43	15.38	15.34	15.31	15.27	15.23	15.19	15.15
		5670	15.39	15.35	15.31	15.27	15.23	15.20	15.16	15.14
		5755	15.50	15.45	15.41	15.36	15.32	15.29	15.24	15.22
		5795	15.07	15.03	14.94	14.90	14.86	14.81	14.77	14.73

8.2 SAR TEST RESULTS

8.2.1 WIFI

Test Position	Channel Frequency (MHz)	Duty Cycle	Maximum Allowed Power (dBm)	Conducted power (dBm)	Drift ±0.21dB	Limit of SAR 1.6 W/kg			
					Drift (dB)	Measured SAR (W/kg)	Scaling factor	Reported SAR (W/kg)	Graph Results
Test Position of Body, 802.11b (Distance=0mm)									
1	2412	1:1	16.5	15.79	0.02	0.147	1.178	0.173	1
2	2412	1:1	16.5	15.79	-0.03	0.052	1.178	0.061	2
Test Position of Body, 802.11a band1 (Distance=0mm)									
1	5200	1:1	14.5	13.80	-0.04	0.211	1.175	0.248	3
2	5200	1:1	14.5	13.80	0.01	0.138	1.175	0.162	4
Test Position of Body, 802.11a band2 (Distance=0mm)									
1	5260	1:1	14.5	13.64	-0.06	0.223	1.219	0.272	5
2	5260	1:1	14.5	13.64	0.03	0.164	1.219	0.200	6
Test Position of Body, 802.11a band3 (Distance=0mm)									
1	**5580**	**1:1**	**14.5**	**13.53**	**0.05**	**0.269**	**1.250**	**0.336**	**7**
2	5580	1:1	14.5	13.53	-0.06	0.108	1.250	0.135	8
Test Position of Body, 802.11a band4 (Distance=0mm)									
1	5825	1:1	14.5	13.66	0.01	0.112	1.213	0.136	9
2	5825	1:1	14.5	13.66	-0.05	0.089	1.213	0.108	10

Note:

1. The value with boldface 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 not required for such test configuration(s).
3. KDB 248227-SAR is not required for 802.11g/n channels when the maximum average output power is less than 1/4dB higher than measured on the corresponding 802.11b channels.
4. KDB 248227-SAR is not required for 802.11n HT20/HT40 channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels

8.3 SIMULTANEOUS TRANSMISSION CONDITIONS

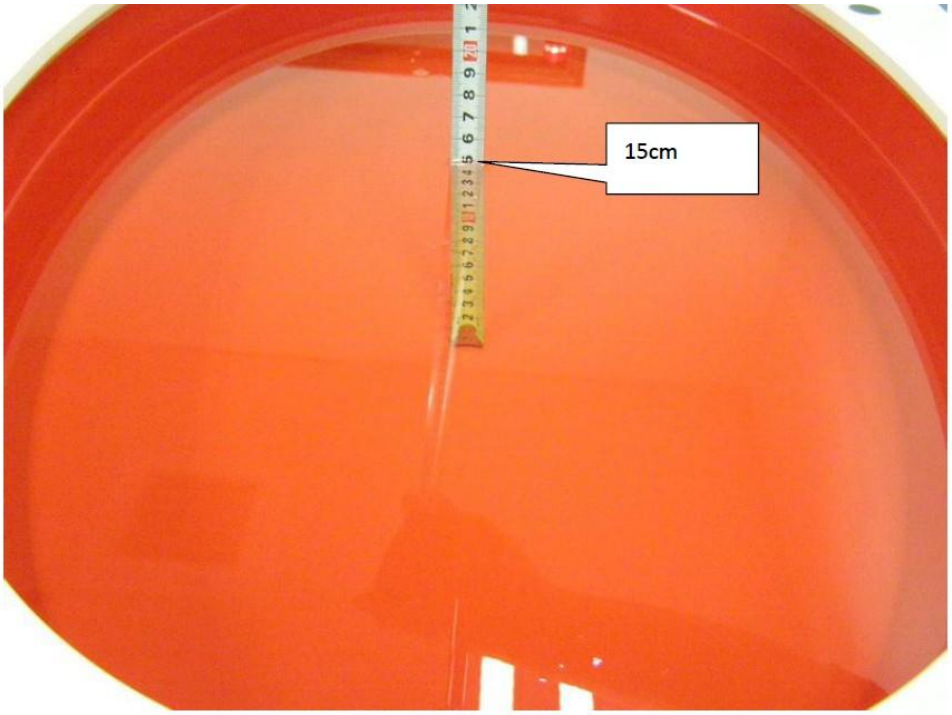
Band		Simultaneous transmission
WIFI	Bluetooth(BT)	NO

APPENDIX

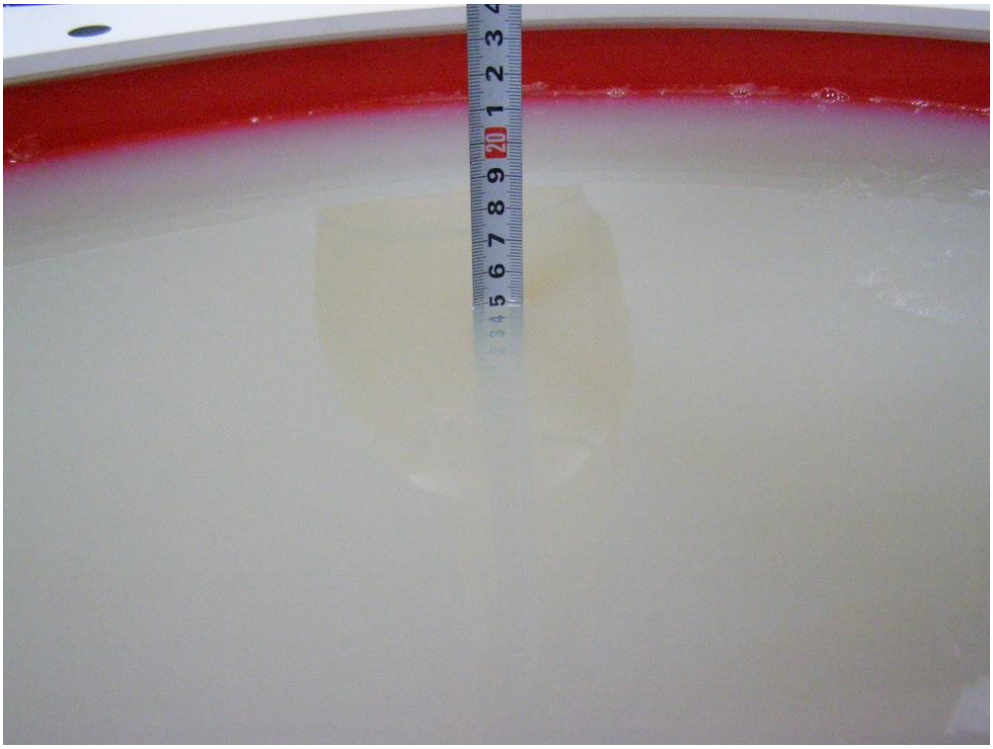
1. Test Layout

Specific Absorption Rate Test Layout

2.4G Liquid depth in the flat Phantom (15cm depth)



5G Liquid depth in the flat Phantom (15cm depth)



2. System Check Results

Date/Time: 11/20/2014 09:18:02

Test Laboratory: BTL Inc.

System Performance Check Body 2450MHz

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:919

Communication System: UID 0, CW (0); Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; σ = 1.99 S/m; εr = 52.02; ρ = 1000 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.49, 7.49, 7.49); Calibrated: 03/10/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Body 2450MHz/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 19.71 W/kg

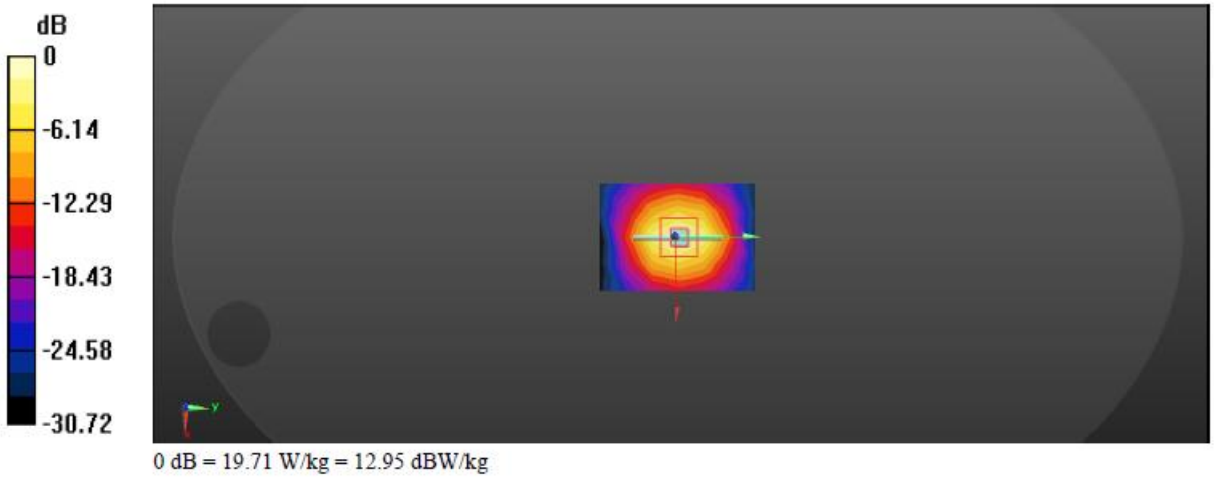
Body 2450MHz/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.5 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 24.6 W/kg

SAR(1 g) = 12.1 W/kg; SAR(10 g) = 6.03 W/kg

Maximum value of SAR (measured) = 18.85 W/kg



0 dB = 19.71 W/kg = 12.95 dBW/kg

Date/Time: 11/22/2014 08:40:09

Test Laboratory: BTL Inc.

System Performance Check Body 5200 MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1160

Communication System: UID 0, CW (0); Frequency: 5200 MHz

Medium parameters used: f = 5200 MHz; σ = 5.39 S/m; εr = 48.5; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.80, 4.80, 4.80); Calibrated: 03/10/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Body 5200 MHz/Area Scan (41x61x1): Interpolated grid: dx=10.00 mm, dy=10.00 mm

Maximum value of SAR (measured) = 14.1 W/kg

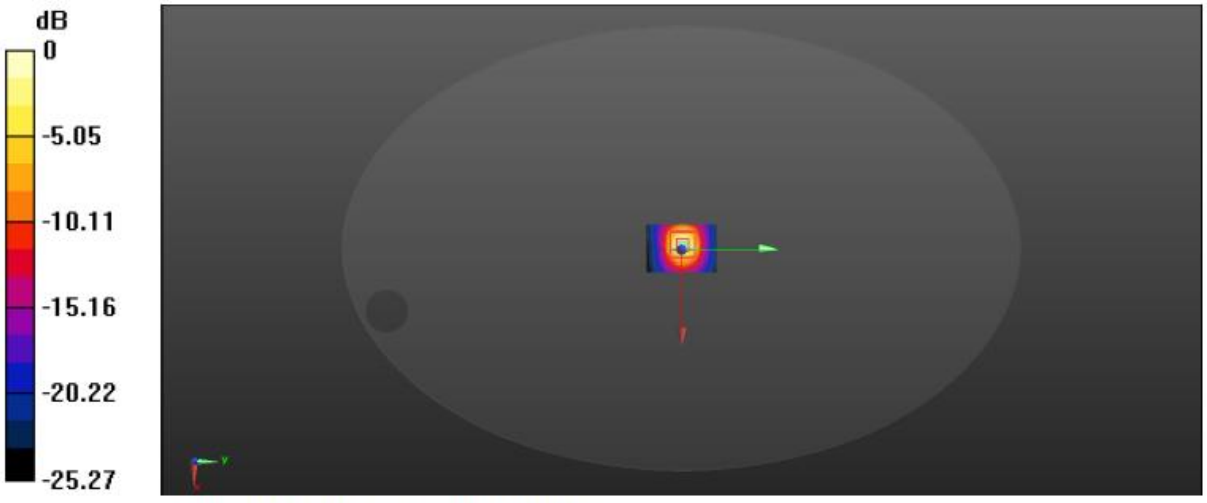
Body 5200 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 36.77 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 26.9 W/kg

SAR(1 g) = 7.21 W/kg; SAR(10 g) = 2.56W/kg

Maximum value of SAR (measured) = 13.8 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg

Date/Time: 11/22/2014 09:12:13

Test Laboratory: BTL Inc.

System Performance Check Body 5300 MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1160

Communication System: UID 0, CW (0); Frequency: 5300 MHz

Medium parameters used: f = 5300 MHz; σ = 5.55 S/m; εr = 49.3; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.60, 4.60, 4.60); Calibrated: 03/10/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Body 5300 MHz/Area Scan (41x61x1): Interpolated grid: dx=10.00 mm, dy=10.00 mm

Maximum value of SAR (measured) = 14.73 W/kg

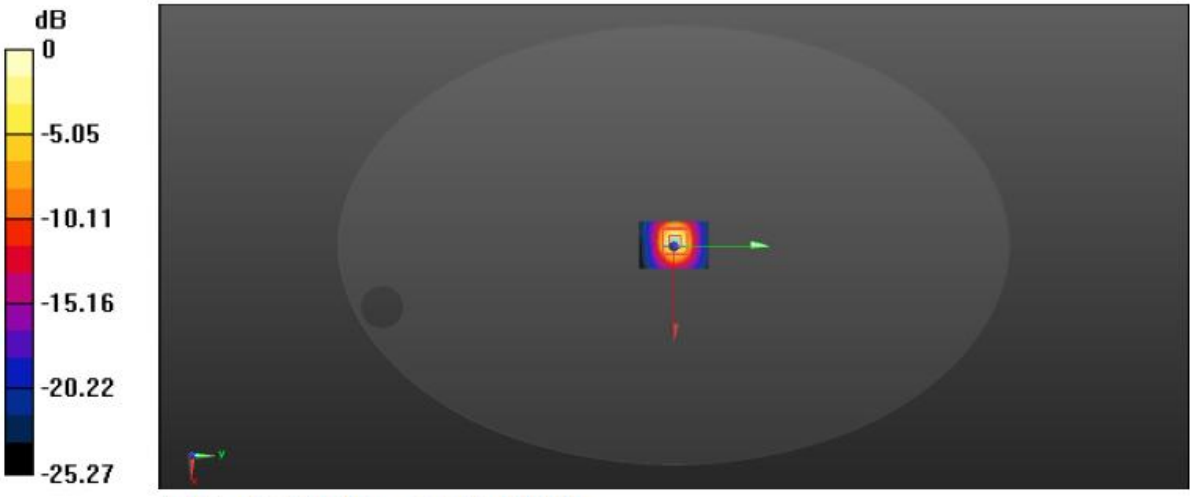
Body 5300 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 38.672 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 27.8 W/kg

SAR(1 g) = 7.41 W/kg; SAR(10 g) = 2.35W/kg

Maximum value of SAR (measured) = 14.33 W/kg



0 dB = 14.73 W/kg = 11.68 dBW/kg

Date/Time: 11/22/2014 09:50:12

Test Laboratory: BTL Inc.

System Performance Check Body 5500 MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1160

Communication System: UID 0, CW (0); Frequency: 5500 MHz

Medium parameters used: f = 5500 MHz; σ = 5.75 S/m; εr = 48.5; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.25, 4.25, 4.25); Calibrated: 03/10/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Body 5500 MHz/Area Scan (5x7x1): Interpolated grid: dx=10.00 mm, dy=10.00 mm

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

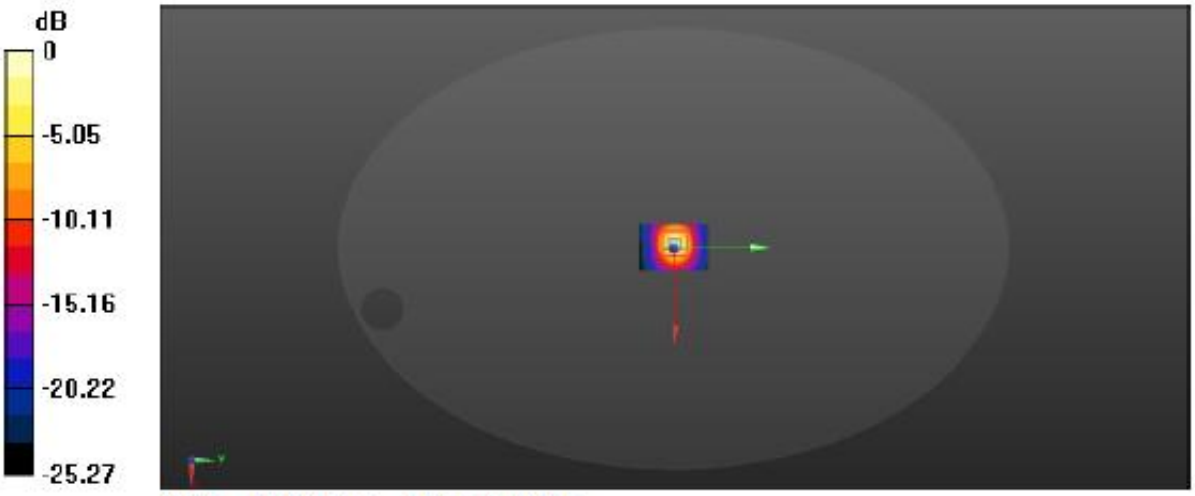
Body 5500 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.825 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 28.1 W/kg

SAR(1 g) = 7.67 W/kg; SAR(10 g) = 2.77W/kg

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



0 dB = 15.8 W/kg = 11.82 dBW/kg

Date/Time: 11/22/2014 10:19:43

Test Laboratory: BTL Inc.

System Performance Check Body 5600 MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1160

Communication System: UID 0, CW (0); Frequency: 5600 MHz

Medium parameters used: f = 5600 MHz; σ = 5.91 S/m; εr = 48.09; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.22, 4.22, 4.22); Calibrated: 03/10/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Body 5600 MHz/Area Scan (5x7x1): Interpolated grid: dx=10.00 mm, dy=10.00 mm

Maximum value of SAR (measured) = 15.3 W/kg

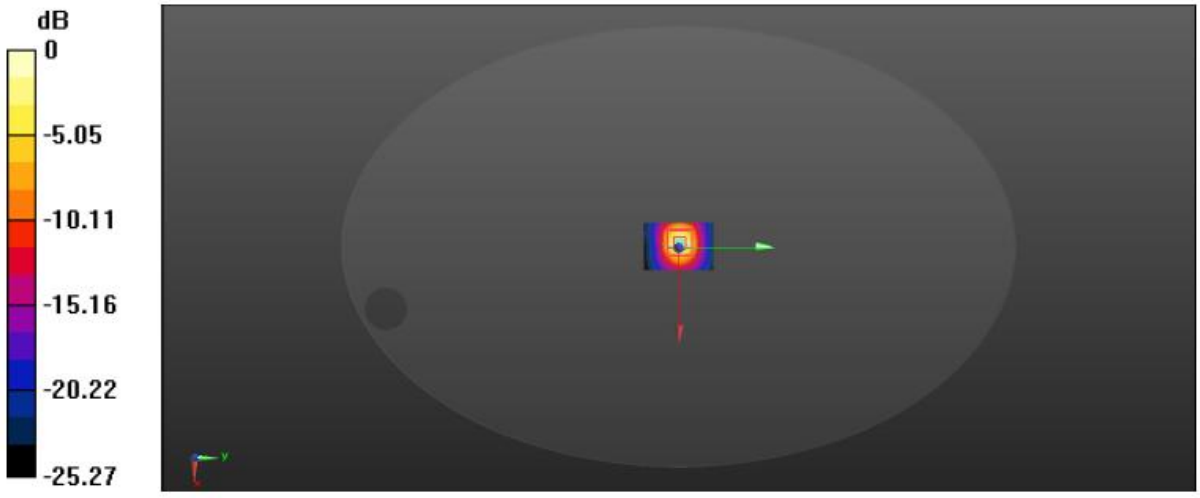
Body 5600 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.618 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 28.5 W/kg

SAR(1 g) = 7.95 W/kg; SAR(10 g) = 2.68W/kg

Maximum value of SAR (measured) = 15.1 W/kg



0 dB = 15.3 W/kg = 11.85 dBW/kg

Date/Time: 11/22/2014 10:41:15

Test Laboratory: BTL Inc.

System Performance Check Body 5800 MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1160

Communication System: UID 0, CW (0); Frequency: 5800 MHz

Medium parameters used: f = 5800 MHz; σ = 6.22 S/m; εr = 47.9; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.34, 4.34, 4.34); Calibrated: 03/10/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Body 5800 MHz/Area Scan (41x61x1): Interpolated grid: dx=10.00 mm, dy=10.00 mm

Reference Value = 34.690 V/m;

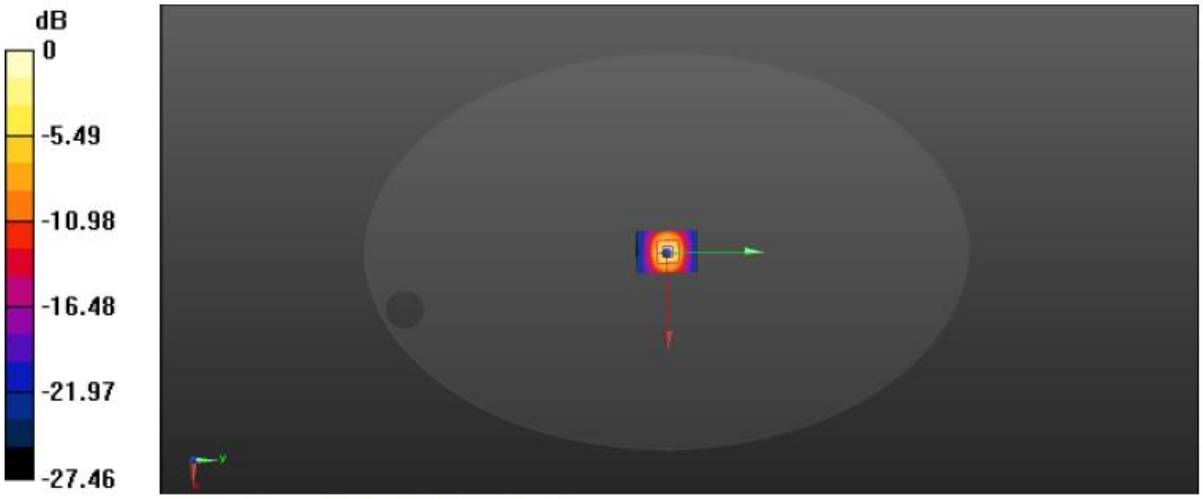
Body 5800 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 34.750 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 31.2 W/kg

SAR(1 g) = 6.88 W/kg; SAR(10 g) = 2.05 W/kg

Maximum value of SAR (measured) = 13.5 W/kg



0 dB = 13.7 W/kg = 11.38 dBW/kg

3. Graph Results

Date/Time: 11/20/2014 15:42:08

Test Laboratory: BTL Inc.

Dreamtab BGTAB-NV24A 802.11b 2412MHz CH1 Test Position 1

DUT: Dreamtab ; Type: BGTAB-NV24A; Serial: NA

Communication System: UID 0, IEEE 802.11b WiFi 2.4GHz (DSSS,1Mbps) (0); Frequency: 2412 MHz

Medium parameters used (interpolated): f = 2412 MHz; σ = 1.963 S/m; εr = 52.58; ρ = 1000 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.54, 7.54, 7.54); Calibrated: 03/10/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Test Position 1/BGTAB-NV24A 802.11b CH1/Area Scan (7x36x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.176 W/kg

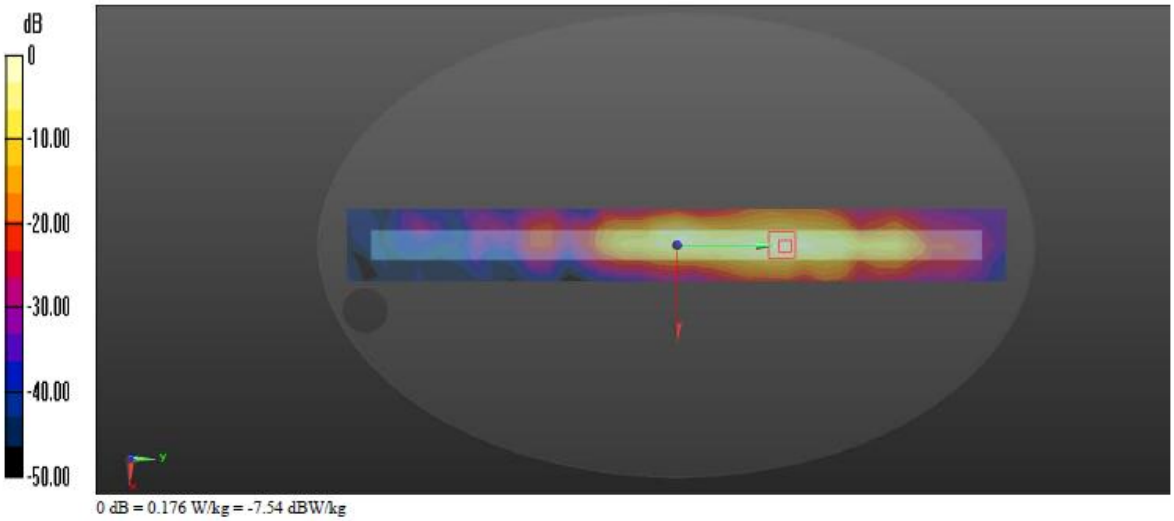
Test Position 1/BGTAB-NV24A 802.11b CH1/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 1.151 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.278 W/kg

SAR(1 g) = 0.147 W/kg; SAR(10 g) = 0.0729 W/kg

Maximum value of SAR (measured) = 0.169 W/kg



Date/Time: 11/20/2014 16:50:21

Test Laboratory: BTL Inc.

Dreamtab BGTAB-NV24A 802.11b 2412MHz CH1 Test Position 2

DUT: Dreamtab ; Type: BGTAB-NV24A; Serial: NA

Communication System: UID 0, IEEE 802.11b WiFi 2.4GHz (DSSS,1Mbps) (0); Frequency: 2412 MHz

Medium parameters used (interpolated): f = 2412 MHz; σ = 1.963 S/m; εr = 52.58; ρ = 1000 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(7.54, 7.54, 7.54); Calibrated: 03/10/2014;
- Sensor-Surface: 2mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Test Position 2/BGTAB-NV24A 802.11b CH1/Area Scan (16x31x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.0685 W/kg

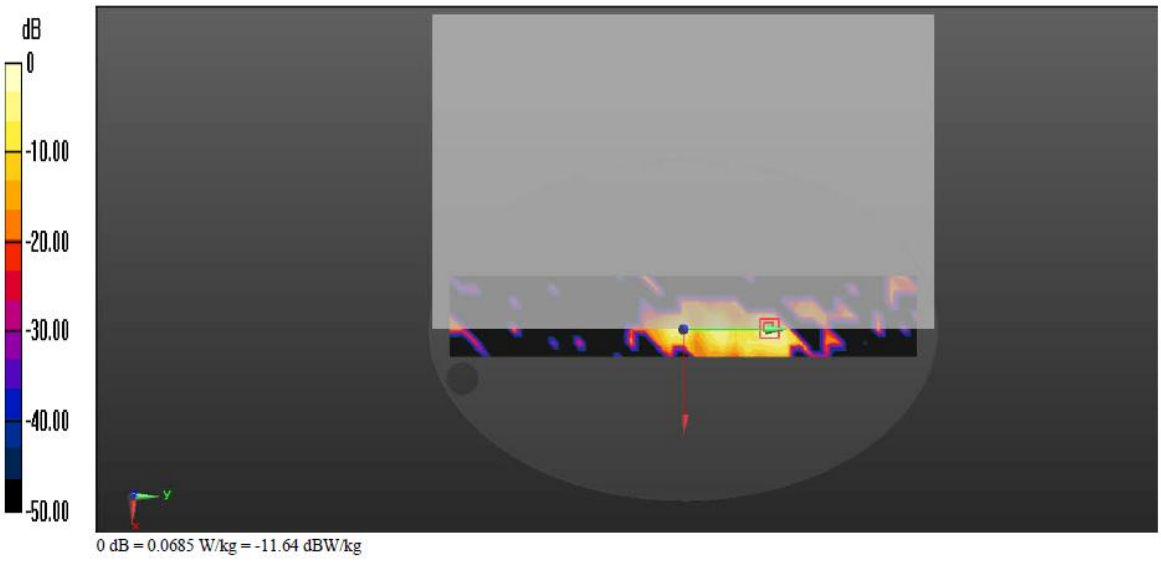
Test Position 2/BGTAB-NV24A 802.11b CH1/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.837 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.113 W/kg

SAR(1 g) = 0.052 W/kg; SAR(10 g) = 0.023 W/kg

Maximum value of SAR (measured) = 0.0702 W/kg



Date/Time: 11/23/2014 14:35:08

Test Laboratory: BTL Inc.

Dreamtab BGTAB-NV24A 802.11a band1 5200MHz CH40 Test Position 1

DUT: Dreamtab ; Type: BGTAB-NV24A; Serial: NA

Communication System: UID 0, IEEE 802.11a WiFi 5G(OFDM, 6 Mbps,) (0); Frequency: 5200 MHz

Medium parameters used: f = 5200 MHz; σ = 5.39 S/m; εr = 48.5; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.80, 4.80, 4.80); Calibrated: 03/10/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Test Position 1/ BGTAB-NV24A CH40/Area Scan (7x41x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.408 W/kg

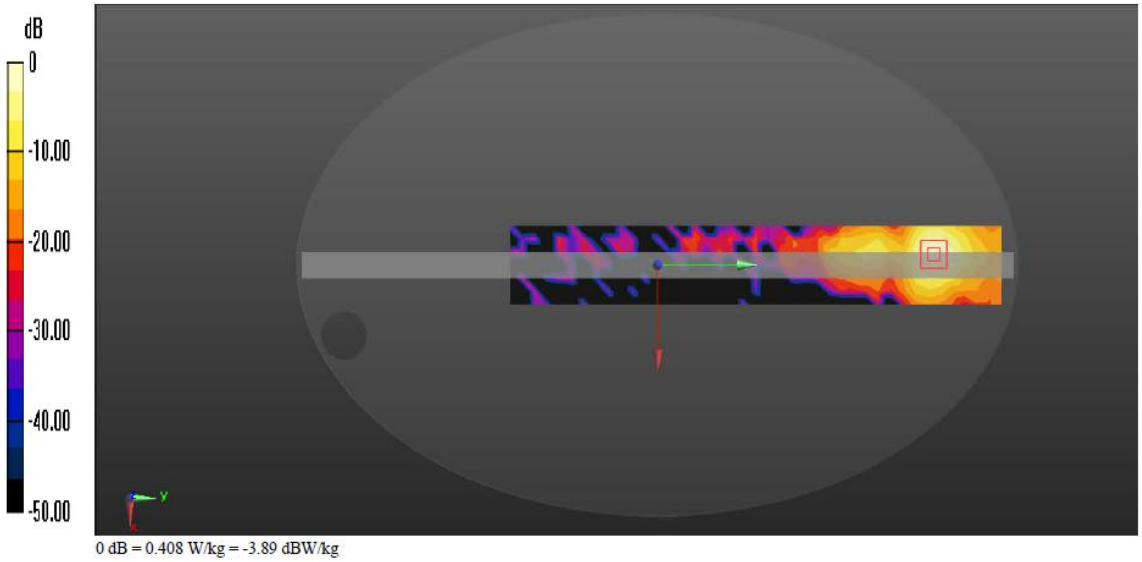
Test Position 1/ BGTAB-NV24A CH40/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.396 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.712 W/kg

SAR(1 g) = 0.211 W/kg; SAR(10 g) = 0.083 W/kg

Maximum value of SAR (measured) = 0.461 W/kg



Date/Time: 11/23/2014 15:42:05

Test Laboratory: BTL Inc.

Dreamtab BGTAB-NV24A 802.11a band1 5200MHz CH40 Test Position 2

DUT: Dreamtab ; Type: BGTAB-NV24A; Serial: NA

Communication System: UID 0, IEEE 802.11a WiFi 5G(OFDM, 6 Mbps,) (0); Frequency: 5200 MHz

Medium parameters used: f = 5200 MHz; σ = 5.39 S/m; εr = 48.5; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.80, 4.80, 4.80); Calibrated: 03/10/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Test Position 2/ BGTAB-NV24A CH40/Area Scan (10x46x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.239 W/kg

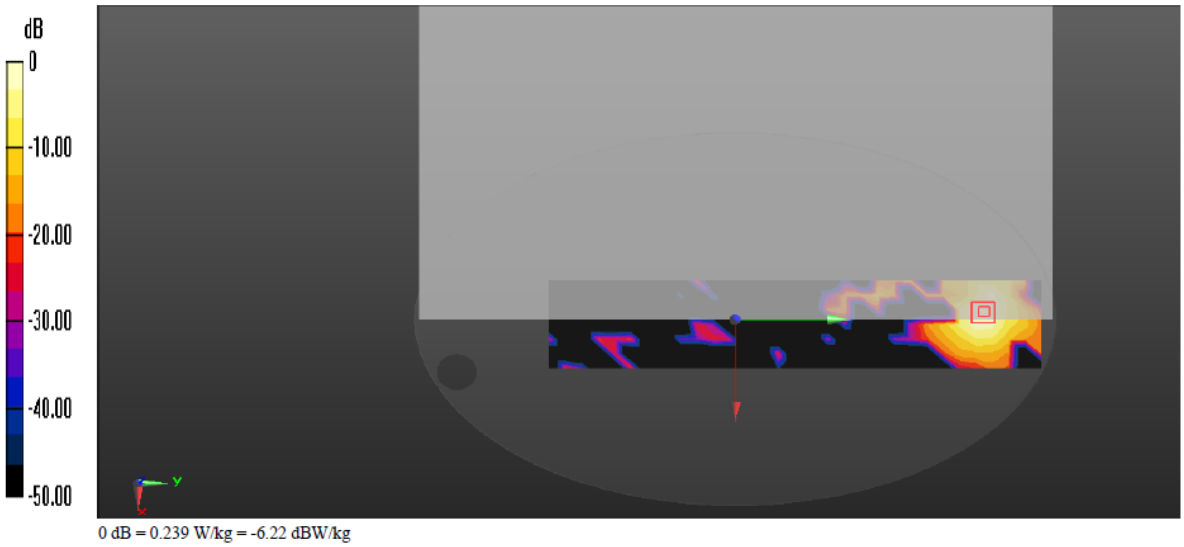
Test Position 2/ BGTAB-NV24A CH40/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.208 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.493 W/kg

SAR(1 g) = 0.138 W/kg; SAR(10 g) = 0.051 W/kg

Maximum value of SAR (measured) = 0.306 W/kg



Date/Time: 11/23/2014 16:38:12

Test Laboratory: BTL Inc.

Dreamtab BGTAB-NV24A 802.11a band2 5260MHz CH52 Test Position 1

DUT: Dreamtab ; Type: BGTAB-NV24A; Serial: NA

Communication System: UID 0, IEEE 802.11a WiFi 5G(OFDM, 6 Mbps,) (0); Frequency: 5260 MHz

Medium parameters used (interpolated): f = 5260 MHz; σ = 5.49 S/m; εr = 48.97; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.66, 4.66, 4.66); Calibrated: 03/10/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Test Position 1/ BGTAB-NV24A CH52/Area Scan (7x41x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.373 W/kg

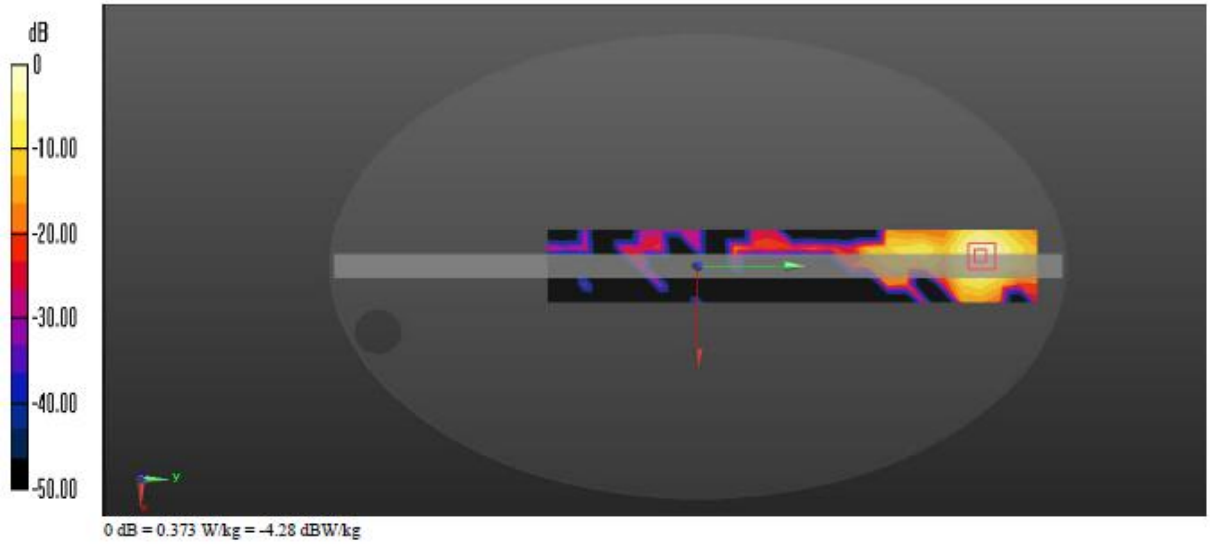
Test Position 1/ BGTAB-NV24A CH52/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.331 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.766 W/kg

SAR(1 g) = 0.223 W/kg; SAR(10 g) = 0.080 W/kg

Maximum value of SAR (measured) = 0.471 W/kg



Date/Time: 11/23/2014 17:30:09

Test Laboratory: BTL Inc.

Dreamtab BGTAB-NV24A 802.11a band2 5260MHz CH52 Test Position 2

DUT: Dreamtab ; Type: BGTAB-NV24A; Serial: NA

Communication System: UID 0, IEEE 802.11a WiFi 5G(OFDM, 6 Mbps,) (0); Frequency: 5260 MHz

Medium parameters used (interpolated): f = 5260 MHz; σ = 5.49 S/m; εr = 48.97; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.66, 4.66, 4.66); Calibrated: 03/10/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Test Position 2/ BGTAB-NV24A CH52/Area Scan (10x46x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.274 W/kg

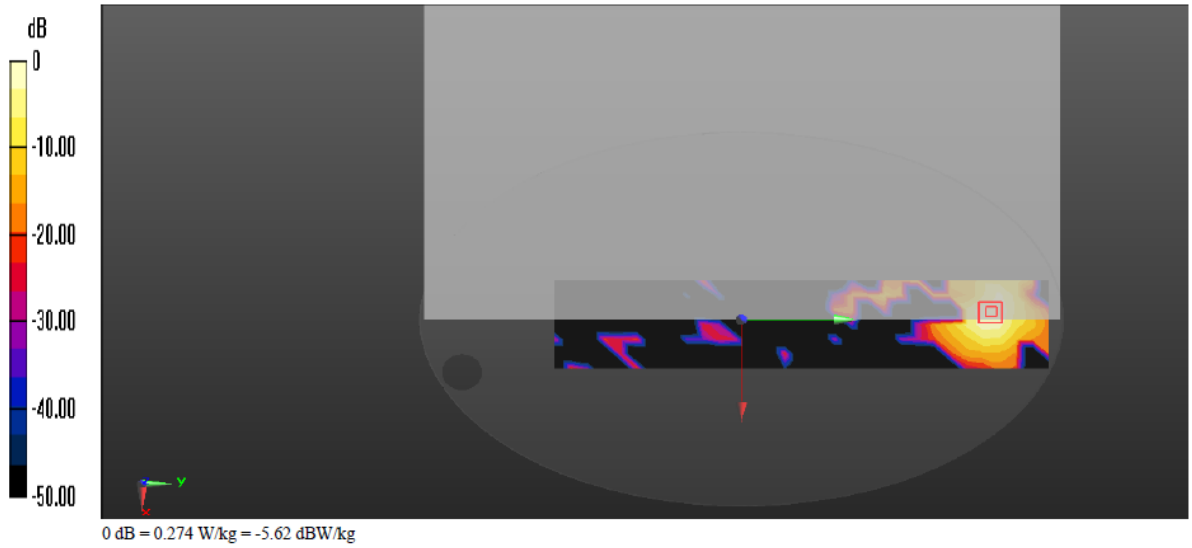
Test Position 2/ BGTAB-NV24A CH52/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.125 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.532 W/kg

SAR(1 g) = 0.164 W/kg; SAR(10 g) = 0.065 W/kg

Maximum value of SAR (measured) = 0.318 W/kg



Date/Time: 11/23/2014 18:43:30

Test Laboratory: BTL Inc.

Dreamtab BGTAB-NV24A 802.11a band3 5580MHz CH116 Test Position 1

DUT: Dreamtab ; Type: BGTAB-NV24A; Serial: NA

Communication System: UID 0, IEEE 802.11a WiFi 5G(OFDM, 6 Mbps,) (0); Frequency: 5580 MHz

Medium parameters used (interpolated): f = 5580 MHz; σ = 5.85 S/m; εr = 48.32; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.23, 4.23, 4.23); Calibrated: 03/10/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Test Position 1/ BGTAB-NV24A CH116/Area Scan (7x41x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.437 W/kg

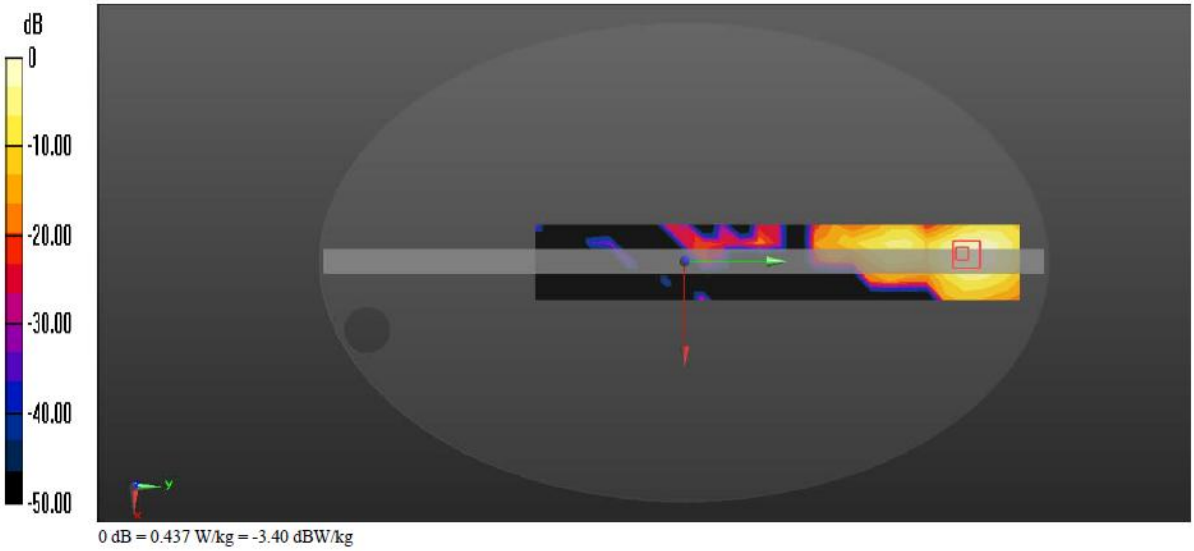
Test Position 1/ BGTAB-NV24A CH116/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.209 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 1.09 W/kg

SAR(1 g) = 0.269 W/kg; SAR(10 g) = 0.093 W/kg

Maximum value of SAR (measured) = 0.583 W/kg



Date/Time: 11/23/2014 19:39:47

Test Laboratory: BTL Inc.

Dreamtab BGTAB-NV24A 802.11a band3 5580MHz CH116 Test Position 2

DUT: Dreamtab ; Type: BGTAB-NV24A; Serial: NA

Communication System: UID 0, IEEE 802.11a WiFi 5G(OFDM, 6 Mbps,) (0); Frequency: 5580 MHz

Medium parameters used (interpolated): f = 5580 MHz; σ = 5.85 S/m; εr = 48.32; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.23, 4.23, 4.23); Calibrated: 03/10/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Test Position 2/ BGTAB-NV24A CH116/Area Scan (10x46x1): Measurement grid: dx=10mm, dy=10mm.

Maximum value of SAR (measured) = 0.225 W/kg

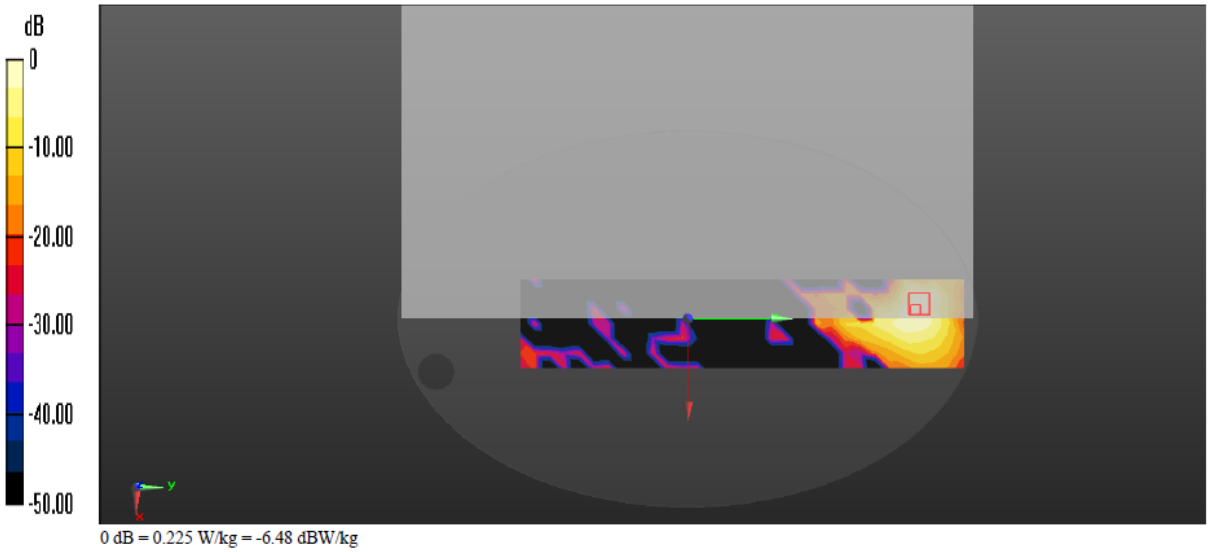
Test Position 2/ BGTAB-NV24A CH116/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.657 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.555 W/kg

SAR(1 g) = 0.108 W/kg; SAR(10 g) = 0.037 W/kg

Maximum value of SAR (measured) = 0.252 W/kg



Date/Time: 11/23/2014 20:35:46

Test Laboratory: BTL Inc.

Dreamtab BGTAB-NV24A 802.11a band4 5825MHz CH165 Test Position 1

DUT: Dreamtab ; Type: BGTAB-NV24A; Serial: NA

Communication System: UID 0, IEEE 802.11a WiFi 5G(OFDM, 6 Mbps,) (0); Frequency: 5825 MHz

Medium parameters used (interpolated): f = 5825 MHz; σ = 6.25 S/m; εr = 47.85; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.34, 4.34, 4.34); Calibrated: 03/10/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Test Position 1/ BGTAB-NV24A CH165/Area Scan (7x41x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.131 W/kg

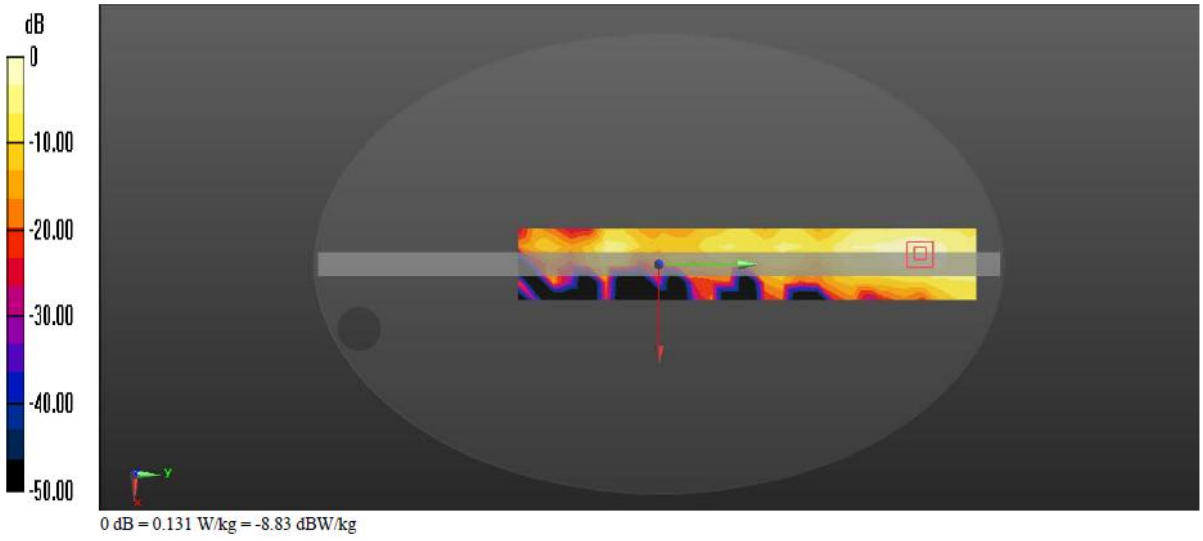
Test Position 1/ BGTAB-NV24A CH165/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.724 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.186 W/kg

SAR(1 g) = 0.112 W/kg; SAR(10 g) = 0.057 W/kg

Maximum value of SAR (measured) = 0.164 W/kg



0 dB = 0.131 W/kg = -8.83 dBW/kg

Date/Time: 11/23/2014 21:29:13

Test Laboratory: BTL Inc.

Dreamtab BGTAB-NV24A 802.11a band4 5825MHz CH165 Test Position 2

DUT: Dreamtab ; Type: BGTAB-NV24A; Serial: NA

Communication System: UID 0, IEEE 802.11a WiFi 5G(OFDM, 6 Mbps,) (0); Frequency: 5825 MHz

Medium parameters used (interpolated): f = 5825 MHz; σ = 6.25 S/m; εr = 47.85; ρ = 996 kg/m3

Phantom section: Flat Section

DASY Configuration:

- Probe: EX3DV4 - SN3898; ConvF(4.34, 4.34, 4.34); Calibrated: 03/10/2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1390; Calibrated: 09/15/2014
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:1222
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Test Position 2/ BGTAB-NV24A CH165/Area Scan (10x46x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.209 W/kg

Test Position 2/ BGTAB-NV24A CH165/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 0.095 V/m; Power Drift = -0.05 dB

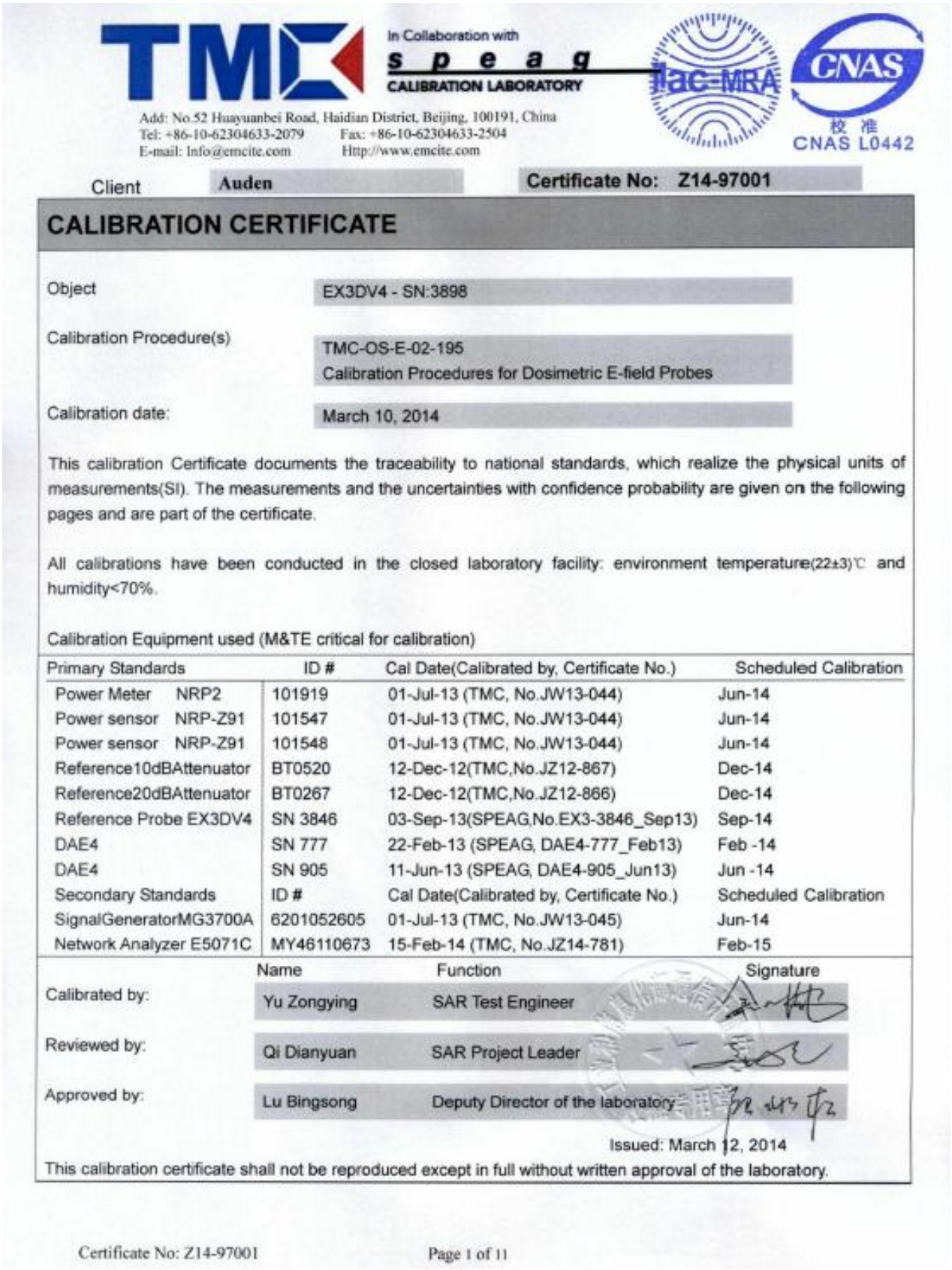
Peak SAR (extrapolated) = 0.298 W/kg

SAR(1 g) = 0.089 W/kg; SAR(10 g) = 0.027 W/kg

Maximum value of SAR (measured) = 0.198 W/kg

4. Probe Calibration Certificate

EX3DV4 - 3898



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CNAS 校准 CNAS L0442

Client Auden Certificate No: Z14-97001

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3898

Calibration Procedure(s) TMC-OS-E-02-195
Calibration Procedures for Dosimetric E-field Probes

Calibration date: March 10, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Power sensor NRP-Z91	101547	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Power sensor NRP-Z91	101548	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Reference10dBAttenuator	BT0520	12-Dec-12(TMC,No.JZ12-867)	Dec-14
Reference20dBAttenuator	BT0267	12-Dec-12(TMC,No.JZ12-866)	Dec-14
Reference Probe EX3DV4	SN 3846	03-Sep-13(SPEAG,No.EX3-3846_Sep13)	Sep-14
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb -14
DAE4	SN 905	11-Jun-13 (SPEAG, DAE4-905_Jun13)	Jun -14
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-13 (TMC, No.JW13-045)	Jun-14
Network Analyzer E5071C	MY46110673	15-Feb-14 (TMC, No.JZ14-781)	Feb-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: March 12, 2014

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

Certificate No: Z14-97001 Page 1 of 11

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-1, "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

Methods Applied and Interpretation of Parameters:

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

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Probe EX3DV4

SN: 3898

Calibrated: March 10, 2014

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY – Parameters of Probe: EX3DV4 - SN: 3898

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)^A	0.50	0.54	0.48	±10.8%
DCP(mV)^B	106.5	104.9	101.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	203.2	±2.1%
		Y	0.0	0.0	1.0		211.8	
		Z	0.0	0.0	1.0		194.9	

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

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

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DASY – Parameters of Probe: EX3DV4 - SN: 3898

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	10.32	10.32	10.32	2.94	0.48	±12%
850	41.5	0.92	9.85	9.85	9.85	0.09	1.71	±12%
900	41.5	0.97	9.83	9.83	9.83	0.29	0.92	±12%
1750	40.1	1.37	8.38	8.38	8.38	0.19	1.35	±12%
1900	40.0	1.40	8.20	8.20	8.20	0.19	1.43	±12%
2000	40.0	1.40	8.19	8.19	8.19	0.18	1.54	±12%
2450	39.2	1.80	7.55	7.55	7.55	0.50	0.76	±12%
2600	39.0	1.96	7.34	7.34	7.34	0.80	0.59	±12%
5200	36.0	4.66	5.52	5.52	5.52	0.39	1.24	±13%
5300	35.9	4.76	5.23	5.23	5.23	0.39	1.01	±13%
5500	35.6	4.96	4.95	4.95	4.95	0.41	1.10	±13%
5600	35.5	5.07	4.74	4.74	4.74	0.42	1.16	±13%
5800	35.3	5.27	4.84	4.84	4.84	0.44	1.07	±13%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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DASY – Parameters of Probe: EX3DV4 - SN: 3898

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	55.5	0.96	10.18	10.18	10.18	0.95	0.64	±12%
850	55.2	0.99	9.63	9.63	9.63	0.19	1.33	±12%
900	55.0	1.05	9.63	9.63	9.63	0.23	1.14	±12%
1750	53.4	1.49	8.16	8.16	8.16	0.19	1.57	±12%
1900	53.3	1.52	7.83	7.83	7.83	0.19	1.63	±12%
2000	53.3	1.52	8.10	8.10	8.10	0.15	3.04	±12%
2450	52.7	1.95	7.49	7.49	7.49	0.61	0.75	±12%
2600	52.5	2.16	7.06	7.06	7.06	0.58	0.77	±12%
5200	49.0	5.30	4.80	4.80	4.80	0.47	1.05	±13%
5300	48.9	5.42	4.60	4.60	4.60	0.42	1.43	±13%
5500	48.6	5.65	4.25	4.25	4.25	0.45	1.56	±13%
5600	48.5	5.77	4.22	4.22	4.22	0.46	1.41	±13%
5800	48.2	6.00	4.34	4.34	4.34	0.50	1.27	±13%

[C] Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequency below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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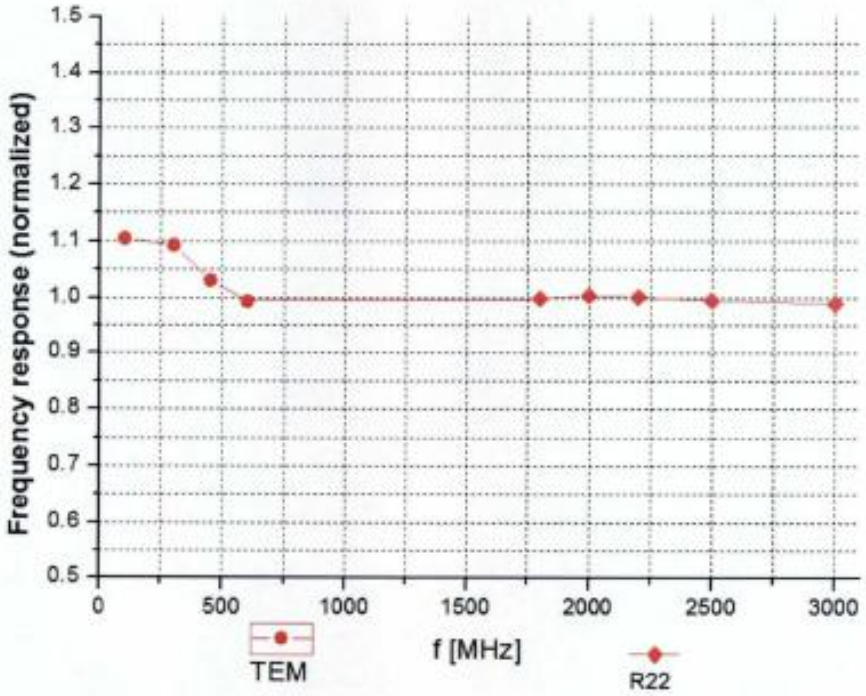
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.5% (k=2)

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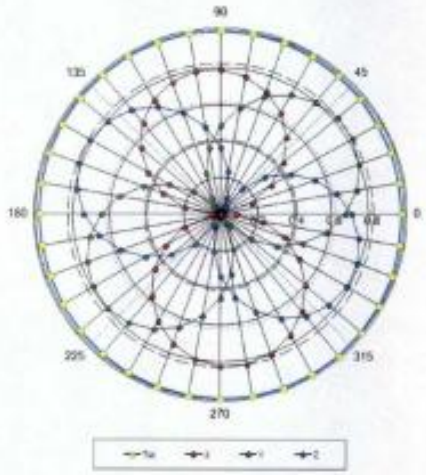
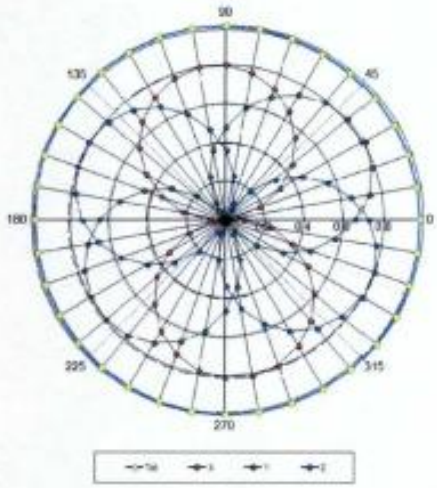
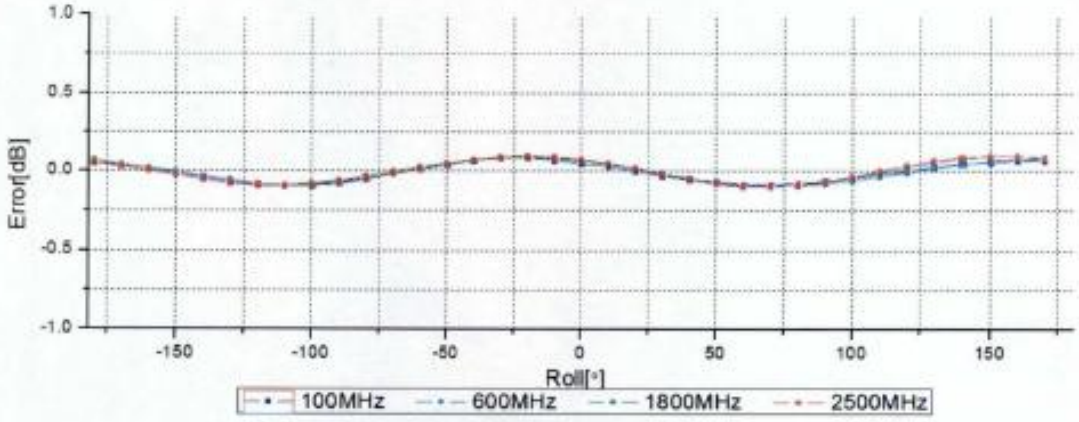
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





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

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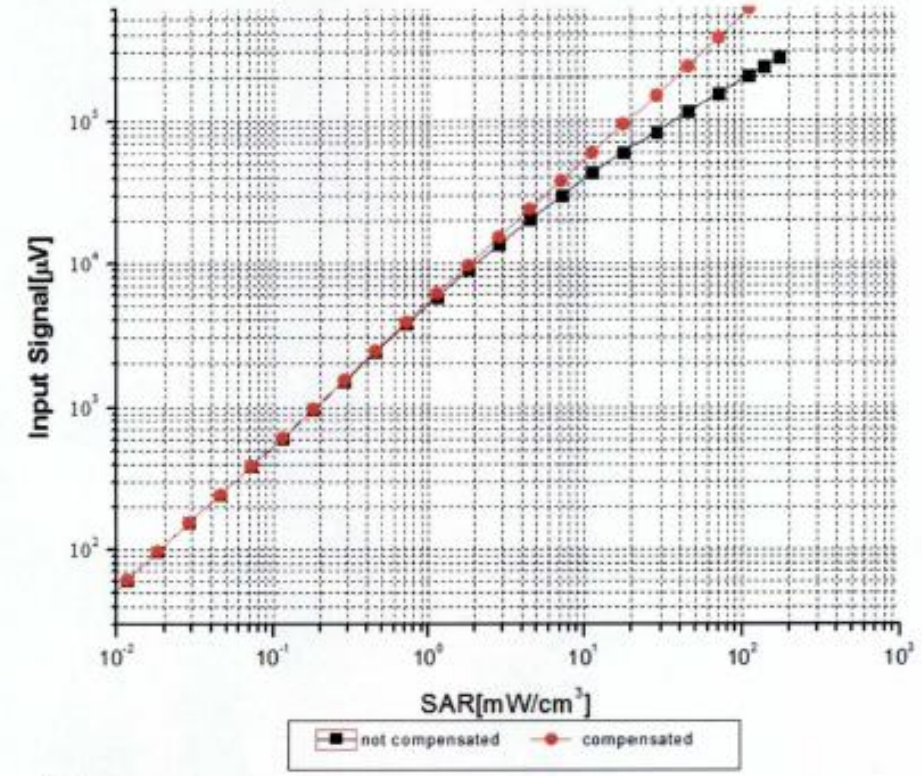
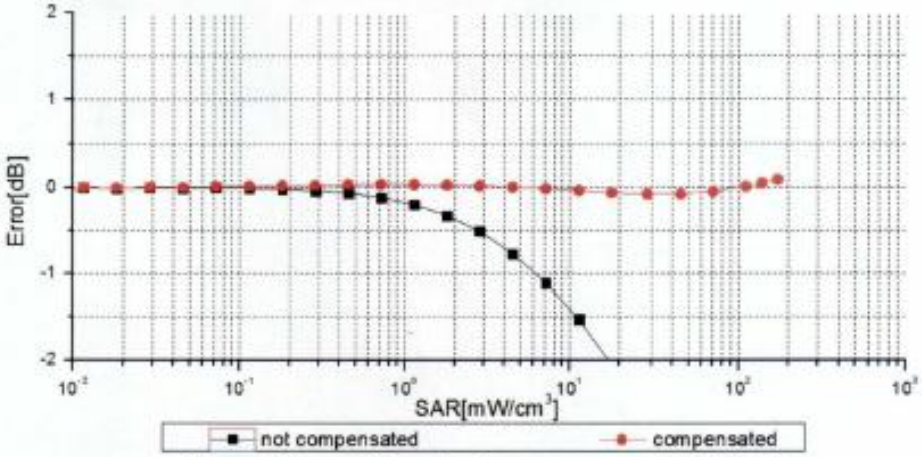
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





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

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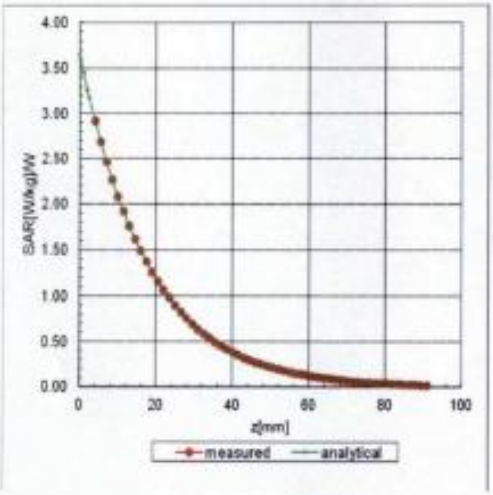
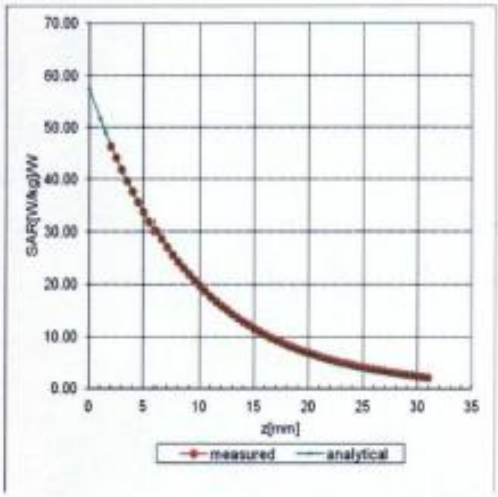
Conversion Factor Assessment

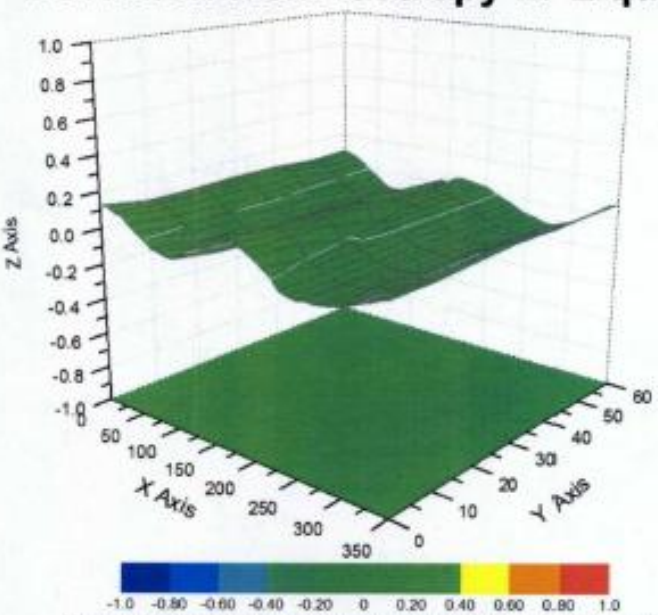
f=900 MHz, WGLS R9(H_convF)



f=2450 MHz, WGLS R26(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

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DASY - Parameters of Probe: EX3DV4 - SN: 3898

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	71
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	2mm

5. (1) D2450V2 Dipole Calibration Certificate

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CALIBRATION No. L0570

Client NIM Certificate No: Z14-97101

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 919
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits
Calibration date:	September 17, 2014

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	102196	14-Mar-14 (CTTL, No.JZ14-896)	Mar-15
Power sensor NRV-Z5	100596	14-Mar-14 (CTTL, No. JZ14-896)	Mar -15
Reference Probe ES3DV3	SN 3142	1- Sep-14 (CTTL-SPEAG, No.JZ14-97079)	Aug-15
DAE3	SN 536	23-Jan-14 (SPEAG, DAE3-536_Jan14)	Jan -15
Signal Generator E4438C	MY49070393	13-Nov-13 (TMC, No.JZ13-394)	Nov-14
Network Analyzer E8362B	MY43021135	19-Oct-13 (TMC, No.JZ13-278)	Oct-14

	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 30, 2014

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ilac-MRA 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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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	39.8 ± 6 %	1.85 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**51.5 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.03 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.0 mW /g ± 20.4 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.2 ± 6 %	1.97 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.8 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**50.7 mW /g ± 20.8 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.02 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.9 mW /g ± 20.4 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	56.6Ω- 0.44jΩ
Return Loss	- 24.1dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	56.2Ω+ 2.77jΩ
Return Loss	- 23.9dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.117 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: 17.09.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 919

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

Medium parameters used: f = 2450 MHz; σ = 1.852 S/m; ε_r = 39.76; ρ = 1000 kg/m^3

Phantom section: Center Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3142; ConvF(4.58, 4.58, 4.58); Calibrated: 2014-09-01;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- 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)

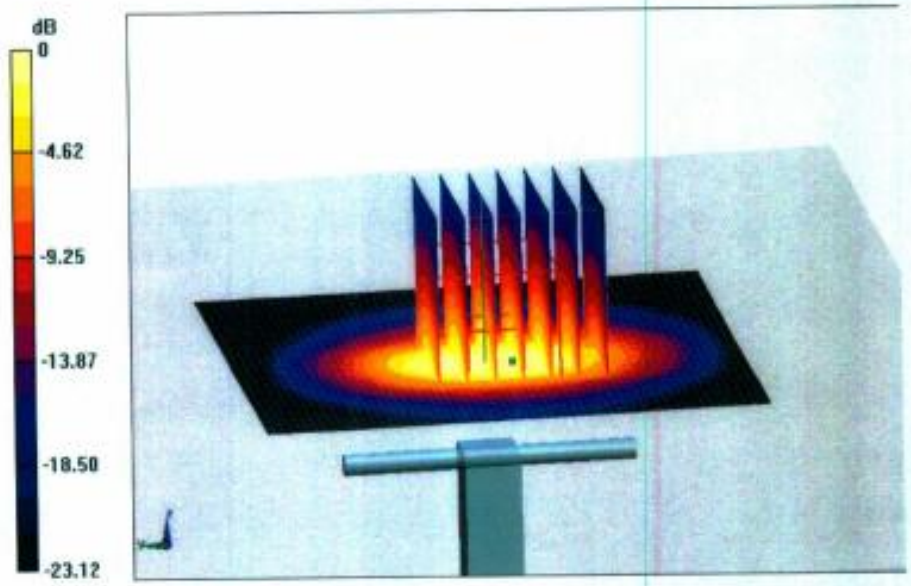
System Performance Check /d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.50 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 27.8 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.03 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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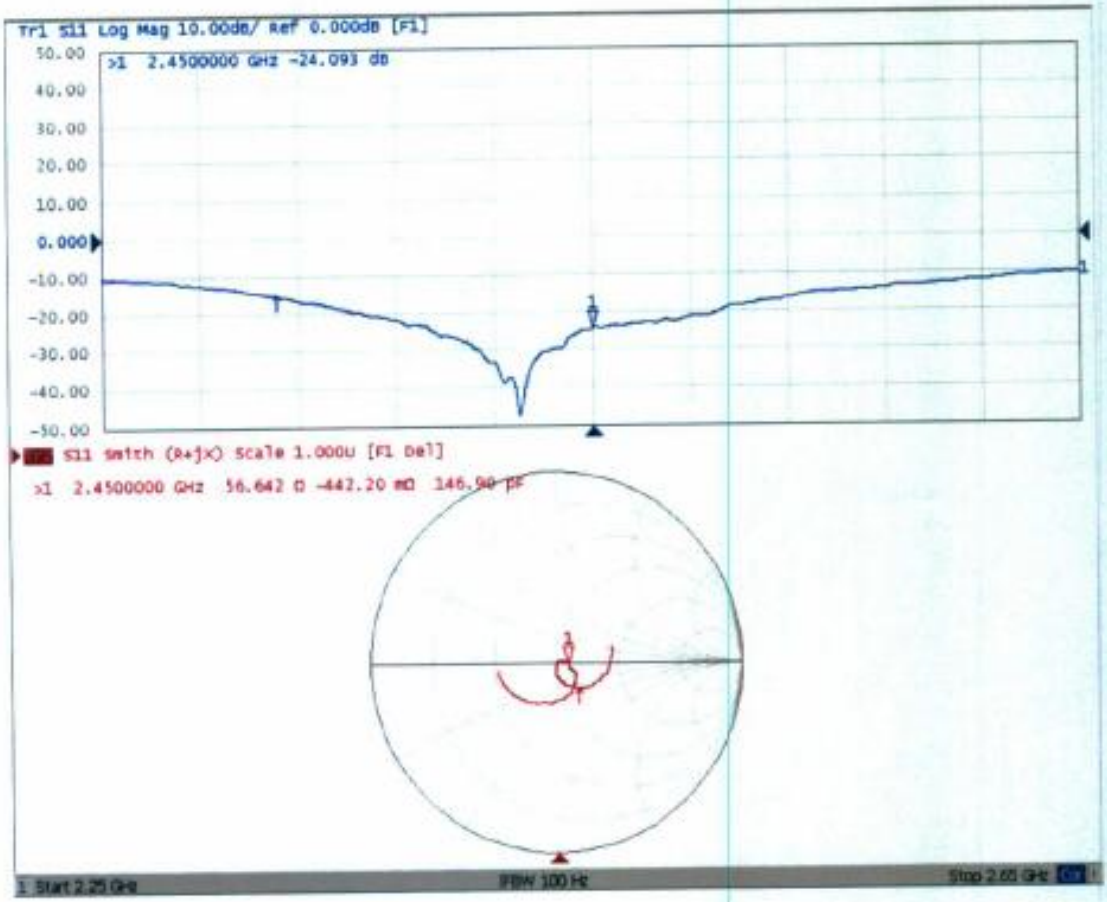
CALIBRATION
No. L0570

Impedance Measurement Plot for Head TSL



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CALIBRATION No. L0570

DASY5 Validation Report for Body TSL Date: 17.09.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 919

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

Medium parameters used: f = 2450 MHz; σ = 1.966 S/m; ε_r = 51.18; ρ = 1000 kg/m^3

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3142; ConvF(4.29, 4.29, 4.29); Calibrated: 2014-09-01;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 2014-01-23
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/3
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

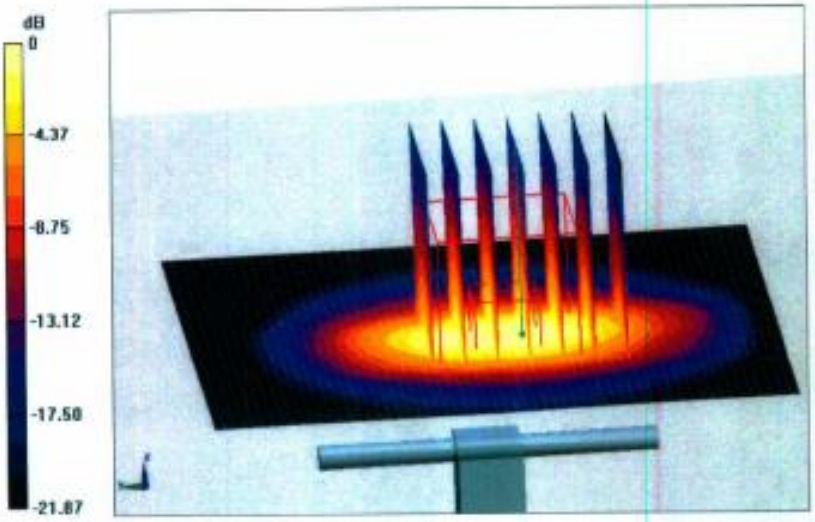
System Performance Check /d=10mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.44 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 25.7 W/kg

SAR(1 g) = 12.8 W/kg; SAR(10 g) = 6.02 W/kg

Maximum value of SAR (measured) = 16.7 W/kg



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

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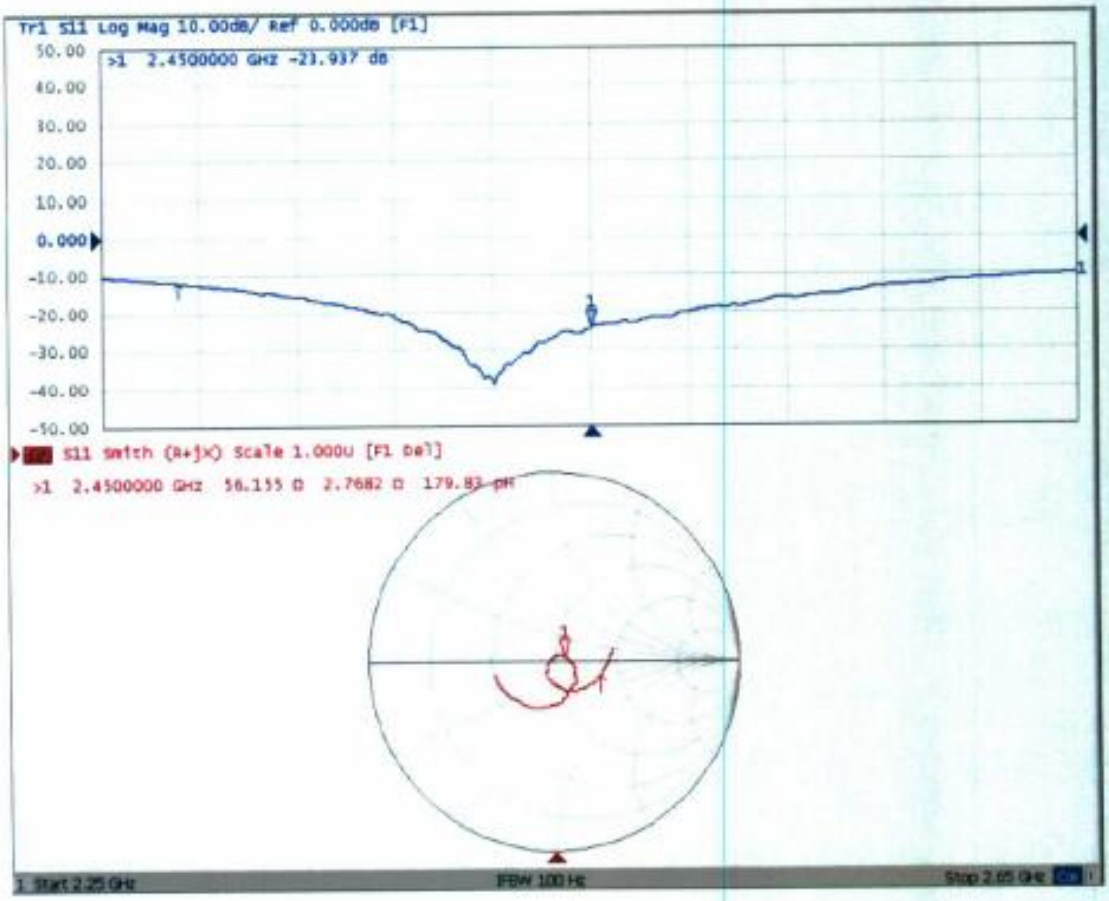
CALIBRATION
No. L0570

Impedance Measurement Plot for Body TSL



5. (2) D5GHzV2 Dipole Calibration Certificate

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CALIBRATION No. L0570

Client NIM Certificate No: Z14-97103

CALIBRATION CERTIFICATE

Object D5GHzV2 - SN: 1160

Calibration Procedure(s) TMC-OS-E-02-194
Calibration Procedures for dipole validation kits

Calibration date: November 4, 2014

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	16-Sep-14 (TMC, No.J14X03421)	Sep -15
Power sensor NRV-Z5	100595	16-Sep-14 (TMC, No. J14X03421)	Sep -15
Reference Probe EX3DV4	SN 3846	24-Sep-14(SPEAG,No.EX3-3846_Sep14)	Sep -15
DAE3	SN 536	23-Jan-14 (SPEAG, DAE3-536_Jan14)	Jan -15
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
Signal Generator E4438C	MY49071430	10-Feb-14 (TMC, No.JZ14-808)	Feb-15
Network Analyzer N5230C	MY49000861	2-Jan-14 (TMC, No.JZ13-633)	Jan-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: November 6, 2014

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Certificate No: Z14-97103 Page 1 of 16

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

b) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Field from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6GHz: Human models, Instrumentation, and Procedures"; Part 2:"Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.8 ± 6 %	4.54 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.96 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**79.5 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.35 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.4 mW /g ± 22.2 % (k=2)**

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Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.6 ± 6 %	4.63 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.08 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**80.6 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.36 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.5 mW /g ± 22.2 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.6 ± 6 %	4.84 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.36 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**83.1 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.38 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 mW /g ± 22.2 % (k=2)**

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Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	4.97 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.36 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**83.3 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.42 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 mW /g ± 22.2 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	5.16 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.18 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**81.5 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.35 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.4 mW /g ± 22.2 % (k=2)**

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Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.6 ± 6 %	5.37 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.45 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**74.7 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.1 mW /g ± 22.2 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.5 ± 6 %	5.49 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.61 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**76.3 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.15 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 mW /g ± 22.2 % (k=2)**

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Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.3 ± 6 %	5.58 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.04 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**80.6 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.26 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**22.7 mW /g ± 22.2 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	49.5 ± 6 %	5.71 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.27 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**83.0 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.32 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.3 mW /g ± 22.2 % (k=2)**

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Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.7 ± 6 %	5.92 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.50 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**75.1 mW /g ± 23.0 % (k=2)**
SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	100 mW input power	2.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.1 mW /g ± 22.2 % (k=2)**

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Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	43.1Ω + 4.88jΩ
Return Loss	- 20.9dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	45.7Ω + 3.98jΩ
Return Loss	- 24.2dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	45.2Ω + 0.23jΩ
Return Loss	- 26.0dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	46.1Ω - 3.42jΩ
Return Loss	- 25.3dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	45.2Ω - 3.60jΩ
Return Loss	- 24.0dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	42.6Ω + 2.80jΩ
Return Loss	- 21.3dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	45.3Ω + 3.83jΩ
Return Loss	- 24.0dB

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Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	45.0Ω - 0.66jΩ
Return Loss	- 25.5dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	44.9Ω - 3.93jΩ
Return Loss	- 23.3dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	43.6Ω - 3.70jΩ
Return Loss	- 22.1dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.213 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

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DASY5 Validation Report for Head TSL Date: 28.10.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1160

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz,
Medium parameters used: f = 5200 MHz; σ = 4.54 mho/m; εr = 35.8; ρ = 1000 kg/m3, Medium parameters used: f = 5300 MHz; σ = 4.63 mho/m; εr = 35.6; ρ = 1000 kg/m3, Medium parameters used: f = 5500 MHz; σ = 4.84 mho/m; εr = 34.6; ρ = 1000 kg/m3, Medium parameters used: f = 5600 MHz; σ = 4.97 mho/m; εr = 34.9; ρ = 1000 kg/m3, Medium parameters used: f = 5800 MHz; σ = 5.16 mho/m; εr = 34.7; ρ = 1000 kg/m3,
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(5.00,5.00,5.00); Calibrated: 2014/9/24, ConvF(4.79,4.79,4.79); Calibrated: 2014/9/24, ConvF(4.64,4.64,4.64); Calibrated: 2014/9/24, ConvF(4.25,4.25,4.25); Calibrated: 2014/9/24, ConvF(4.44,4.44,4.44); Calibrated: 2014/9/24,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 23/1/2014
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/3
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Dipole Calibration for Head Tissue/Pin=100mW, d=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.54 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 30.2 W/kg
SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.35 W/kg
Maximum value of SAR (measured) = 18.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.85 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 30.2 W/kg
SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.36 W/kg
Maximum value of SAR (measured) = 18.7 W/kg

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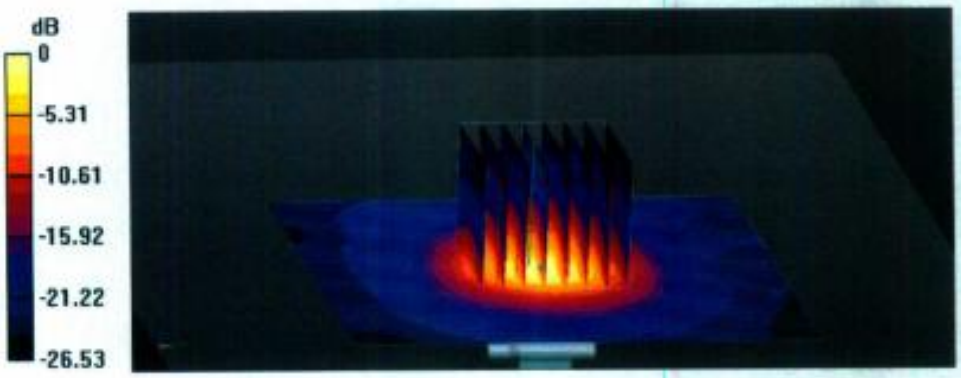
Dipole Calibration for Head Tissue/Pin=100mW, d=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 74.34 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 30.2 W/kg
SAR(1 g) = 8.36 W/kg; SAR(10 g) = 2.38 W/kg
Maximum value of SAR (measured) = 21.3 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.50 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 33.4 W/kg
SAR(1 g) = 8.36 W/kg; SAR(10 g) = 2.42 W/kg
Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.24 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 36.9 W/kg
SAR(1 g) = 8.18 W/kg; SAR(10 g) = 2.35 W/kg
Maximum value of SAR (measured) = 20.2 W/kg



0 dB = 18.4 W/kg = 12.65 dBW/kg

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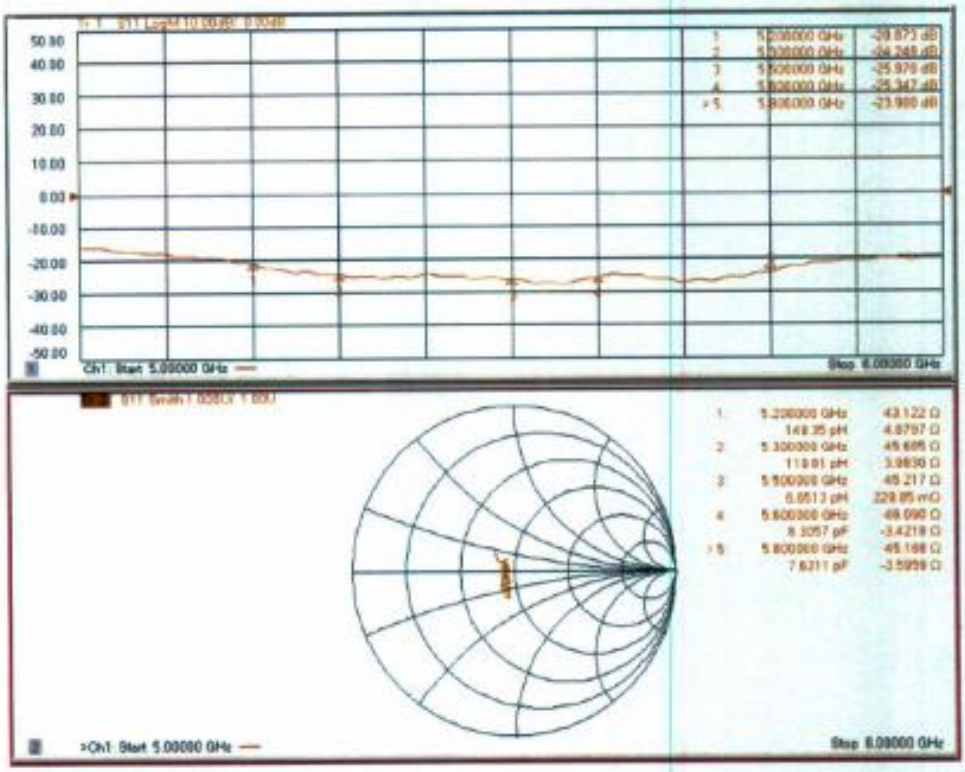
Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL Date: 04.11.2014

Test Laboratory: CTTL, Beijing, China

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1160

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz,
Medium parameters used: f = 5200 MHz; σ = 5.37 mho/m; εr = 49.6; ρ = 1000 kg/m3, Medium parameters used: f = 5300 MHz; σ = 5.49 mho/m; εr = 49.5; ρ = 1000 kg/m3, Medium parameters used: f = 5500 MHz; σ = 5.58 mho/m; εr = 49.3; ρ = 1000 kg/m3, Medium parameters used: f = 5600 MHz; σ = 5.71 mho/m; εr = 49.54; ρ = 1000 kg/m3, Medium parameters used: f = 5800 MHz; σ = 5.92 mho/m; εr = 48.7; ρ = 1000 kg/m3,
Phantom section: Center Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3846; ConvF(4.32,4.32,4.32); Calibrated: 2014/9/24, ConvF(4.18,4.18,4.18); Calibrated: 2014/9/24, ConvF(3.8,3.8,3.8); Calibrated: 2014/9/24, ConvF(3.76,3.76,3.76); Calibrated: 2014/9/24, ConvF(3.86,3.86,3.86); Calibrated: 2014/9/24,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 23/1/2014
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/3
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Dipole Calibration for Head Tissue/Pin=100mW, d=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.51 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 32.2 W/kg
SAR(1 g) = 7.45 W/kg; SAR(10 g) = 2.1 W/kg
Maximum value of SAR (measured) = 17.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.4 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 33.3 W/kg
SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.15 W/kg
Maximum value of SAR (measured) = 18.3 W/kg

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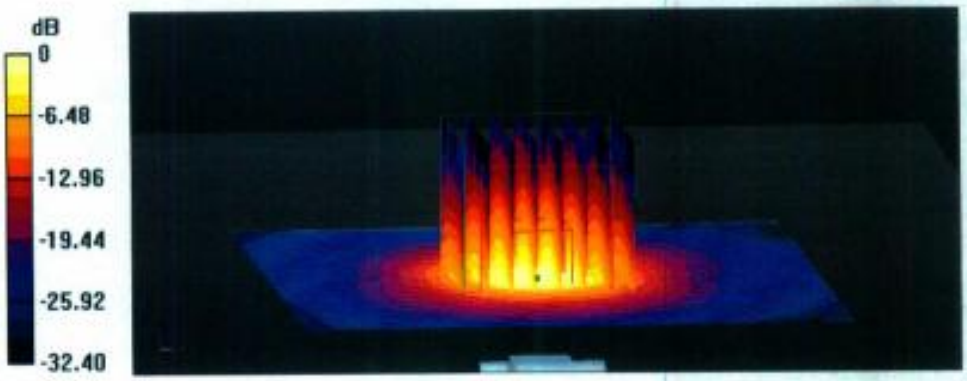
Dipole Calibration for Head Tissue/Pin=100mW, d=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.65 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 35.5 W/kg
SAR(1 g) = 8.04 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.22 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 37.1 W/kg
SAR(1 g) = 8.27 W/kg; SAR(10 g) = 2.32 W/kg
Maximum value of SAR (measured) = 20.2 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.37 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 34.7 W/kg
SAR(1 g) = 7.5 W/kg; SAR(10 g) = 2.1 W/kg
Maximum value of SAR (measured) = 18.6 W/kg



0 dB = 17.4 W/kg = 12.40 dBW/kg

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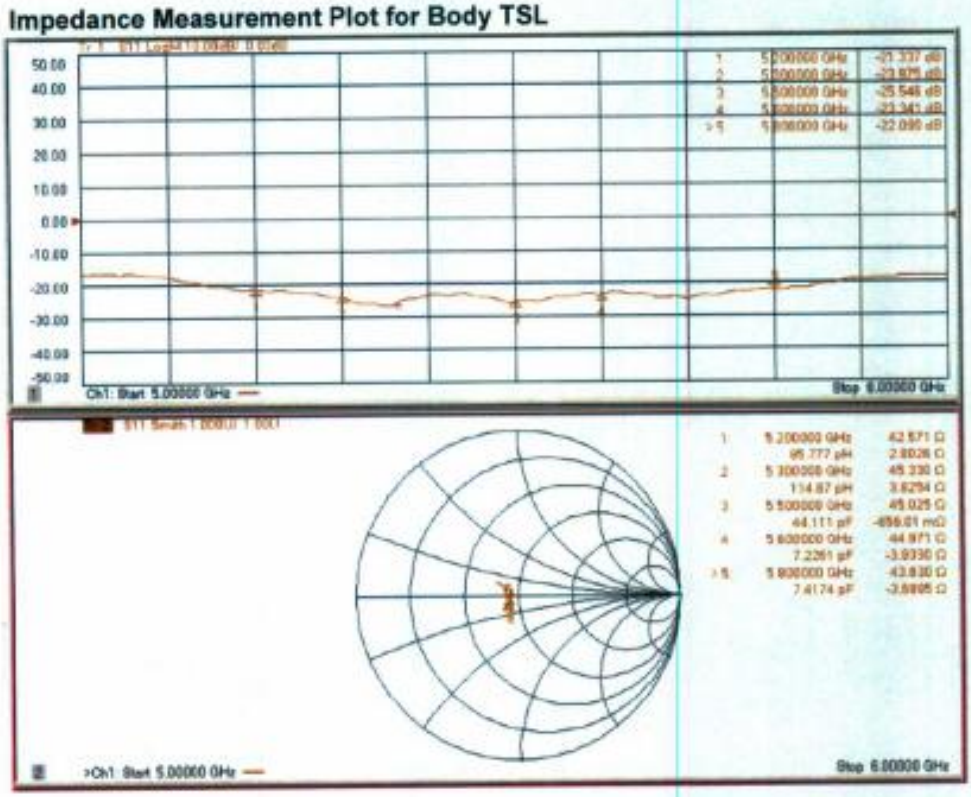
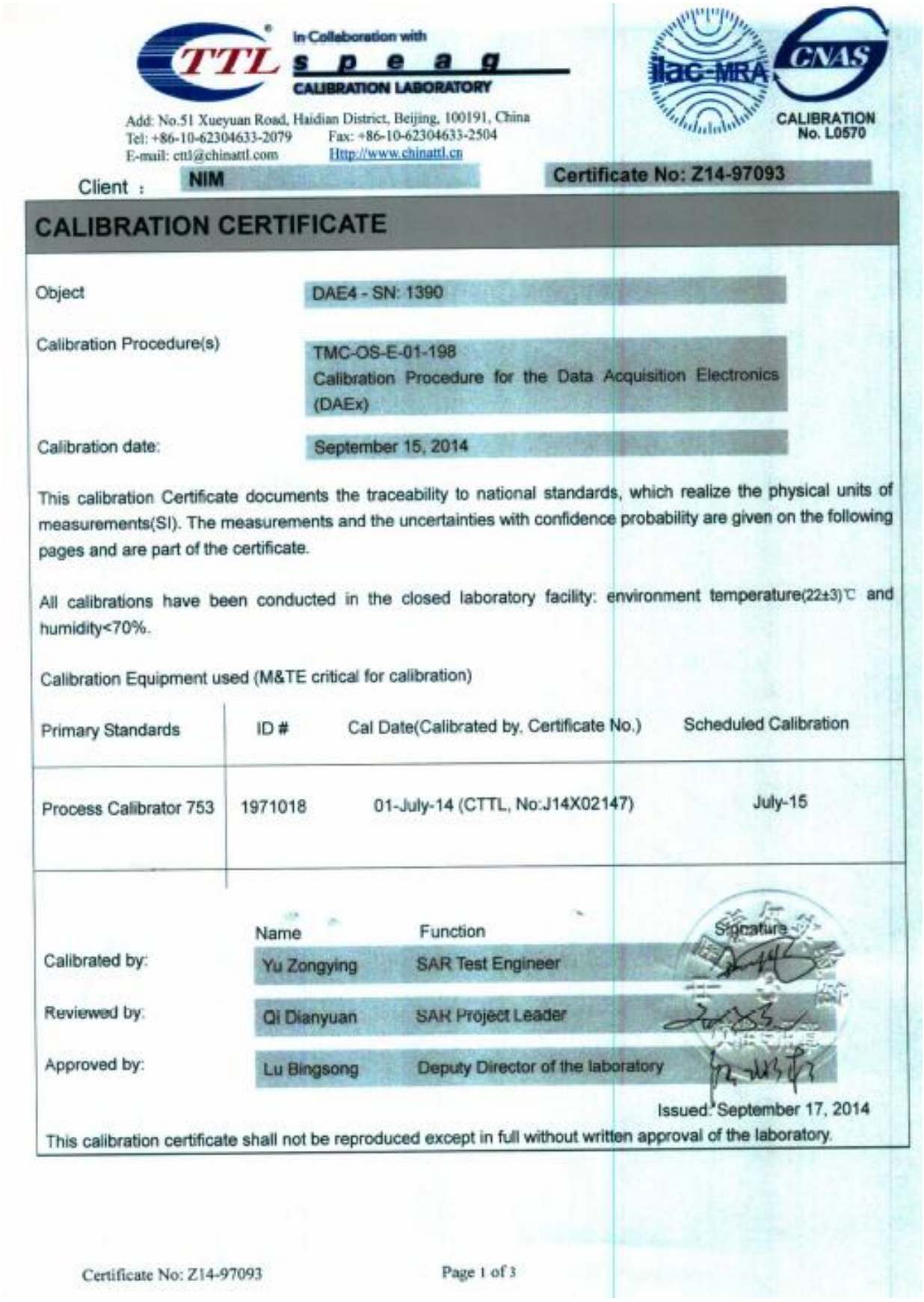
Impedance Measurement Plot for Body TSL



6. DAE4 Calibration Certificate



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ilac-MRA CNAS CALIBRATION No. L0570

Client : NIM Certificate No: Z14-97093

CALIBRATION CERTIFICATE

Object	DAE4 - SN: 1390
Calibration Procedure(s)	TMC-OS-E-01-198 Calibration Procedure for the Data Acquisition Electronics (DAEx)
Calibration date:	September 15, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Process Calibrator 753	1971018	01-July-14 (CTTL, No:J14X02147)	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: September 17, 2014

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Glossary:

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

Methods Applied and Interpretation of Parameters:

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

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DC Voltage Measurement

A/D - Converter Resolution nominal

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

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

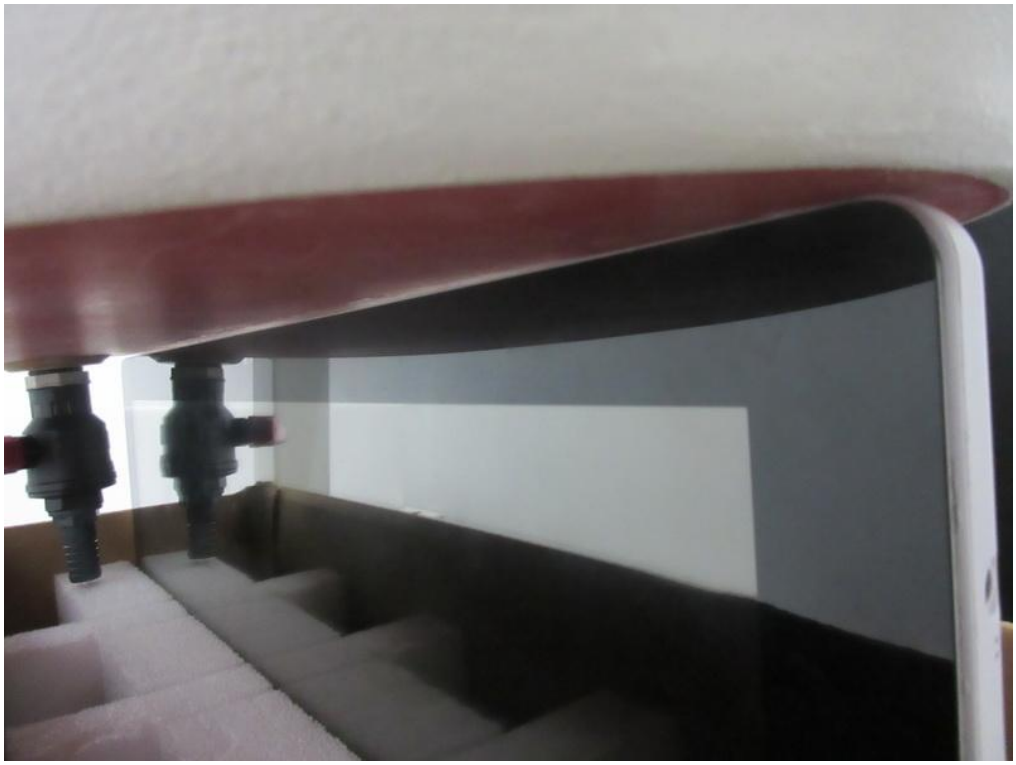
Calibration Factors	X	Y	Z
High Range	403.699 ± 0.15% (k=2)	403.423 ± 0.15% (k=2)	404.3 ± 0.15% (k=2)
Low Range	3.96442 ± 0.7% (k=2)	3.98241 ± 0.7% (k=2)	3.98276 ± 0.7% (k=2)

Connector Angle

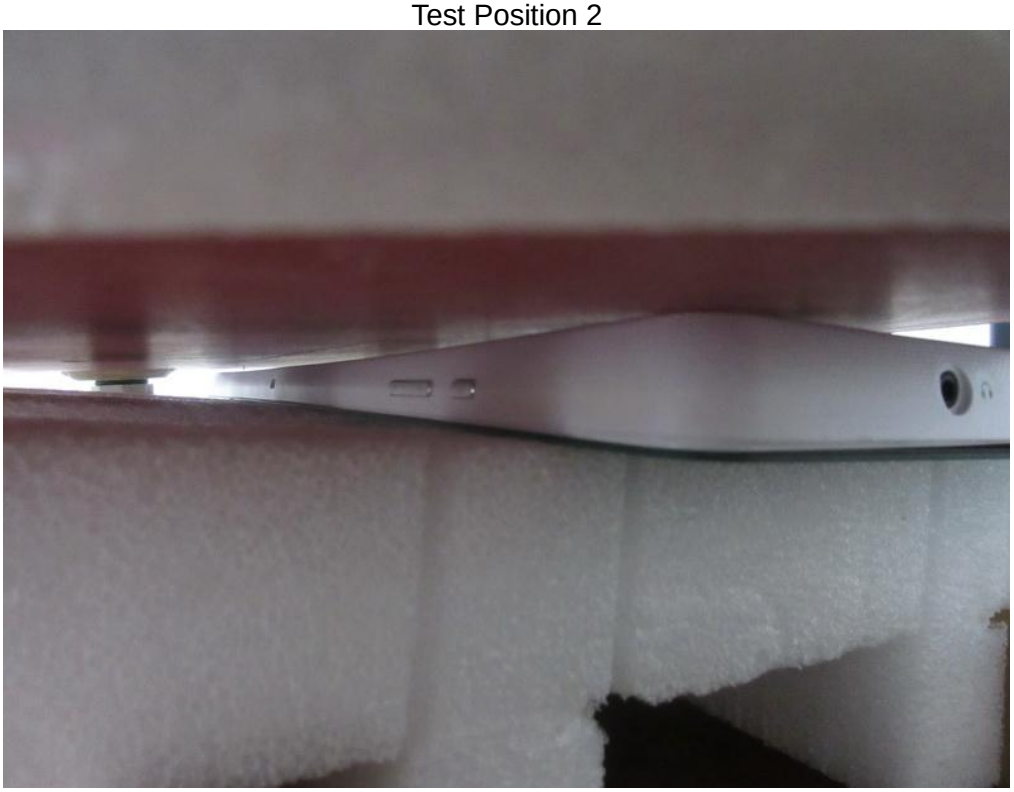
Connector Angle to be used in DASY system	72° ± 1 °

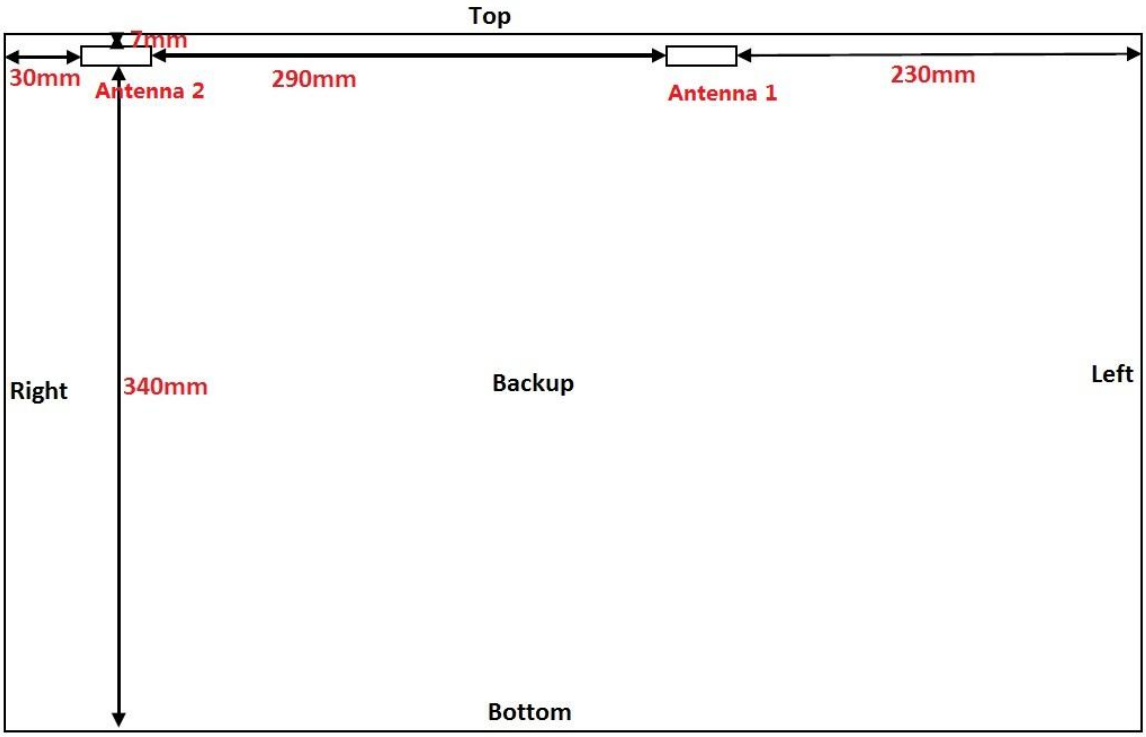
7. EUT Testing Position and Antenna Location

Test Position 1



Test Position 2




Top
7mm
30mm
Antenna 2
290mm
Antenna 1
230mm
Right
340mm
Backup
Left
Bottom