Prüfbericht-Nr.: *Test Report No.:*	**17040273 004**	**Auftrags-Nr.:** *Order No.:*	164013498	Seite 1 von 64 *Page 1 of 64*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order date:*	29.04.2014	
Auftraggeber: *Client:*	Shenzhen Yifang Digital Technology Co., Ltd. Building NO.23, Fifth Region, Baiwangxin Industrial Park, Songbai Rd., Nanshan, Shenzhen, Guangdong 518108, China			
Prüfgegenstand: *Test item:*	MID			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	NS-15AT07			
Auftrags-Inhalt: *Order content:*	FCC/IC Certification			
Prüfgrundlage: *Test specification:*	CFR Title 47 Part 2 Subpart J Section 2.1093 ANSI/IEEE C95.1-1992 IEEE 1528-2003 FCC OET Bulletin 65 Supplement C (Edition 01-01) RSS-102 Issue 4 March 2010			
Wareneingangsdatum: *Date of receipt:*	15.05.2014			
Prüfmuster-Nr.: *Test sample No.:*	A000055953-006			
Prüfzeitraum: *Testing period:*	22.05.2014			
Ort der Prüfung: *Place of testing:*	Shenzhen Academy of Metrology and Quality Inspection National Testing Center for Digital Electronic Products			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: *Test result*:*	Pass			

geprüft von / tested by:			**kontrolliert von / reviewed by:**		
12.06.2014	Tom Wang/Assistant Project Manager	Tom Wang	12.06.2014	Sam Lin/Technical Certifier	[signature]
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / Other:

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:* Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T = nicht getestet
Legend:	*1 = very good* *P(ass) = passed a.m. test specification(s)*	*2 = good*	*3 = satisfactory* *F(ail) = failed a.m. test specification(s)*	*4 = sufficient* *N/A = not applicable*	*5 = poor* *N/T = not tested*

Hi Nancy , Tina

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1. Reported SAR Summary

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

Highest Reported Standalone SAR Summary

Exposure Position	Frequency Band	Highest Reported1g-SAR (W/kg)	Equipment Class	Highest Reported1g-SAR (W/kg)
Body	WLAN 2.4GHz Band	1.306	DTS	1.306

2. General information

2.1 Report information

This report is not a certificate of quality; it only applies to the sample of the specific product/equipment given at the time of its testing. The results are not used to indicate or imply that they are application to the similar items. In addition, such results must not be used to indicate or imply that SMQ approves recommends or endorses the manufacture, supplier or use of such product/equipment, or that SMQ in any way guarantees the later performance of the product/equipment.
The sample mentioned in this report is/are supplied by Applicant, SMQ therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture or any information supplied.
Additional copies of the report are available to the Applicant at an additional fee. No third part can obtain a copy of this report through SMQ, unless the applicant has authorized SMQ in writing to do so.

2.2 Laboratory Accreditation and Relationship to Customer

The testing report were performed by the Shenzhen Academy of Metrology and quality Inspection EMC Laboratory (Guangdong EMC compliance testing center), in their facilities located at Bldg. of Metrology & Quality Inspection, Longzhu Road, Nanshan District, Shenzhen, Guangdong, China. At the time of testing, Laboratory is accredited by the following organizations:

China National Accreditation Service for Conformity Assessment (CNAS) accredits the Laboratory for conformance to FCC standards, EMC international standards and EN standards. The Registration Number is CNAS L0579.
The Laboratory is listed in the United States of American Federal Communications Commission (FCC), and the registration number are 446246 806614 994606 (semi anechoic chamber).

The Laboratory is registered to perform emission tests with Industry Canada (IC), and the registration number is IC4174.

TUV Rhineland accredits the Laboratory for conformance to IEC and EN standards, the registration number is E2024086Z02.

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a 7'' tablet with Wi-Fi & Bluetooth function.
For details refer to the User Manual and Circuit Diagram.

3.2 Ratings and System Details

Table 1: Technical Specification

Device type:	Portable device		
EUT Name:	MID		
Type Identification:	NS-15AT07		
Serial Number	A000055604-006		
FCC ID:	S7JNS15AT07		
IC:	8082A-NS15AT07		
Operating mode(s) / WiFi:	802.11b	802.11g	802.11n
Test modulation	DSSS	OFDM	OFDM
Transmit Frequency Range (MHz):	2412-2462	2412-2462	2412-2462
Operating mode(s) / Bluetooth:	Bluetooth 4.0		
Test modulation	GFSK, π/4DQPSK, 8DPSK		
Transmit Frequency Range (MHz):	2402-2480		
Hardware version:	V2.1		
Software version:	1.0.9		
Antenna type:	Integrated antenna		
Battery options:	DC 3.7V, 3500mAh		

Table 2: List of WLAN Channel of 802.11b/g/n mode

802.11b		802.11g		802.11n (HT20)	
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	2412	1	2412	1	2412
2	2417	2	2417	2	2417
3	2422	3	2422	3	2422
4	2427	4	2427	4	2427
5	2432	5	2432	5	2432
6	2437	6	2437	6	2437
7	2442	7	2442	7	2442
8	2447	8	2447	8	2447
9	2452	9	2452	9	2452
10	2457	10	2457	10	2457
11	2462	11	2462	11	2462

Table 3: List of Bluetooth Channel (BDR & EDR mode)

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
0	2402.00	20	2442.00	40	2442.00	60	2462.00
1	2403.00	21	2423.00	41	2443.00	61	2463.00
2	2404.00	22	2424.00	42	2444.00	62	2464.00
3	2405.00	23	2425.00	43	2445.00	63	2465.00
4	2406.00	24	2426.00	44	2446.00	64	2466.00
5	2407.00	25	2427.00	45	2447.00	65	2467.00
6	2408.00	26	2428.00	46	2448.00	66	2468.00
7	2409.00	27	2429.00	47	2449.00	67	2469.00
8	2410.00	28	2430.00	48	2450.00	68	2470.00
9	2411.00	29	2431.00	49	2451.00	69	2471.00
10	2412.00	30	2432.00	50	2452.00	70	2472.00
11	2413.00	31	2433.00	51	2453.00	71	2473.00
12	2414.00	32	2434.00	52	2454.00	72	2474.00
13	2415.00	33	2435.00	53	2455.00	73	2475.00
14	2416.00	34	2436.00	54	2456.00	74	2476.00
15	2417.00	35	2437.00	55	2457.00	75	2477.00
16	2418.00	36	2438.00	56	2458.00	76	2478.00
17	2419.00	37	2439.00	57	2459.00	77	2479.00
18	2420.00	38	2440.00	58	2460.00	78	2480.00
19	2421.00	39	2441.00	59	2461.00		

Table 4: List of Bluetooth Channel (LE mode)

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
0	2402.00	10	2422.00	20	2442.00	30	2462.00
1	2404.00	11	2424.00	21	2444.00	31	2464.00
2	2406.00	12	2426.00	22	2446.00	32	2466.00
3	2408.00	13	2428.00	23	2448.00	33	2468.00
4	2410.00	14	2430.00	24	2450.00	34	2470.00
5	2412.00	15	2432.00	25	2452.00	35	2472.00
6	2414.00	16	2434.00	26	2454.00	36	2474.00
7	2416.00	17	2436.00	27	2456.00	37	2476.00
8	2418.00	18	2438.00	28	2458.00	38	2478.00
9	2420.00	19	2440.00	29	2460.00	39	2480.00

3.3 Independent Operation Modes

The basic operation modes are:

A. WiFi transmitting
   1. 802.11b
      i. CH1
      ii. CH6
      iii. CH11
   2. 802.11g
      i. CH1
      ii. CH6
      iii. CH11
   3. 802.11n
      i. CH1
      ii. CH6
      iii. CH11

B. Off

3.4 Submitted Documents

- Bill of Material
- Constructional Drawing
- PCB Layout
- Photo Document
- Circuit Diagram
- Instruction Manual
- Rating Label

3.5 RF output power Tune up limit

Mode / Band	**Maximum Target Average Power(dBm)**		
	IEEE 802.11		
	b	g	n
WLAN 2.4 GHz Band	14.5	13	12

Mode / Band	**Maximum Target Average Power(dBm)**
Bluetooth (BDR & EDR)	-3.5

Mode / Band	**Maximum Target Average Power(dBm)**
Bluetooth (LE)	0.5

3.6 SAR Limit

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

4. Test Conditions

4.1 Temperature and Humidity

Ambient temperature (℃):	21-22
Ambient humidity (RH %):	59-60

4.2 Introduction of SAR

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for general public group.
SAR Definition:

$$SAR = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dv}\right) \quad SAR = C\frac{\delta T}{\delta t} \quad SAR = \frac{\sigma |E|^2}{\rho}$$

In the first equation, the SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density ρ).
In the second equation, C is the specific head capacity, δT is the temperature rise and δt is the exposure duration.
The last equation relates to the electrical field, where σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the rms electrical field strength.
However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.
SAR is expressed in units of Watts per kilogram (W/kg)

4.3 Test Configuration

For WWAN SAR testing, the device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the EUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT.

5. Description of the test equipments

5.1 Measurement System and Components

No.	Equipment	Model No.	Manufacturer	Asset No.	Last Calibration Data	Period
1	SAR test system	TX60L	SPEAG	SB6810	---	---
2	SAR Probe	ES3DV3	SPEAG	SB6810/02	2013.10.31	1year
3	System Validation Dipole,835MHz	D835V2	SPEAG	SB6810/04	2012.09.24	2year
4	System Validation Dipole,1900MHz	D1900V2	SPEAG	SB6810/05	2012.09.21	2year
5	System Validation Dipole,2450MHz	D2450V2	SPEAG	SB6810/06	2012.10.18	2year
6	Dielectric Probe Kit	85070E	SPEAG	SB6810/12	---	---
7	Dual-directional coupler,0.10-2.0GHz	778D	Agilent	SB6810/07	---	---
8	Dual-directional coupler,2.00-18GHz	772D	Agilent	SB6810/08		
9	Coaxial attenuator	8491A	Agilent	SB6810/09	---	---
10	Power Amplifier	ZHL42W	Agilent	SB6810/10	---	---
11	Signal Generator	SMR20	R&S	SB3438	2014.01.16	1year
12	Power Meter	NRVD	R&S	SB3437	2014.01.19	1year
13	Call Tester	CMU 200	R&S	SB3441	2014.03.30	1year
14	Data Acquisition Electronics	DAE4	SPEAG	SB6810/01	2014.10.30	1Year
15	Software	DASY52	SPEAG	SB6810/14	--	--
16	Network Analyzer	E5071C	Agilent	SB9011/01	2014.04.24	1Year

The measurements were performed using an automated near-field scanning system, DASY5, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements was the “advanced extrapolation” algorithm.

5.2 Isotropic E-field Probe Type ES3DV3

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., butyl diglycol)
Calibration	Calibration certificate in Appendix C
Frequency	10MHz to 4GHz (dosimetry); Linearity: ±0.2dB (30MHz to 4GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 20 mm Body diameter: 12 mm Tip diameter: 3.9 mm Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

5.3 Phantoms

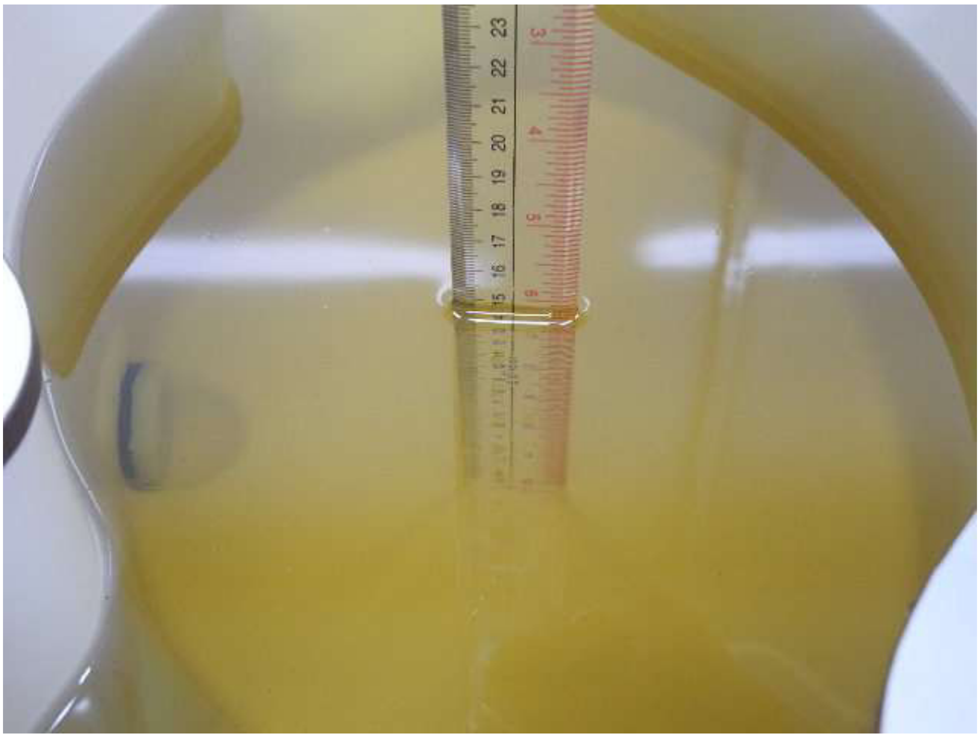
The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6mm). System checking was performed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

5.4 Tissue-equivalent Liquids

Tissue-equivalent liquids that are used for testing, which are made mainly of sugar, salt and water solution. All tests were carried out using tissue-equivalent liquids whose dielectric parameters were within ± 5% of the recommended values. All tests were carried out within 24 hours of measuring the dielectric parameters.
The depth of the Tissue-equivalent liquid was 15.0±0.5 cm measured from the ear reference point (ERP) during system checking and device measurements.

5.4.1 Tissue-equivalent liquid Recipes

The following recipe(s) were used for Head Tissue-equivalent liquid(s):



Ingredient (% by weight)	Frequency Band			
	800-900	1800-1900	800-900	1800-1900
Tissue Type	Head	Head	Body	Body
Water	40.6	56.1	50.8	68.9
Sugar	58.2	--	48.2	--
Salt	1.0	0.03	0.9	0.1
Preventol D-7	0.1	--	0.1	--
DGMBE	--	43.87	--	31
Cellulose	0.1	--	--	--
Ingredient (% by weight)	Frequency Band			
	2450	2450		
Tissue Type	Head	Body		
Water	54.8	68.4		
Sugar	--	--		
Salt	--	--		
Preventol D-7	--	--		
DGMBE	45.2	31.6		
Cellulose	--	--		

5.4.2 Tissue-equivalent liquids used in the Measurements

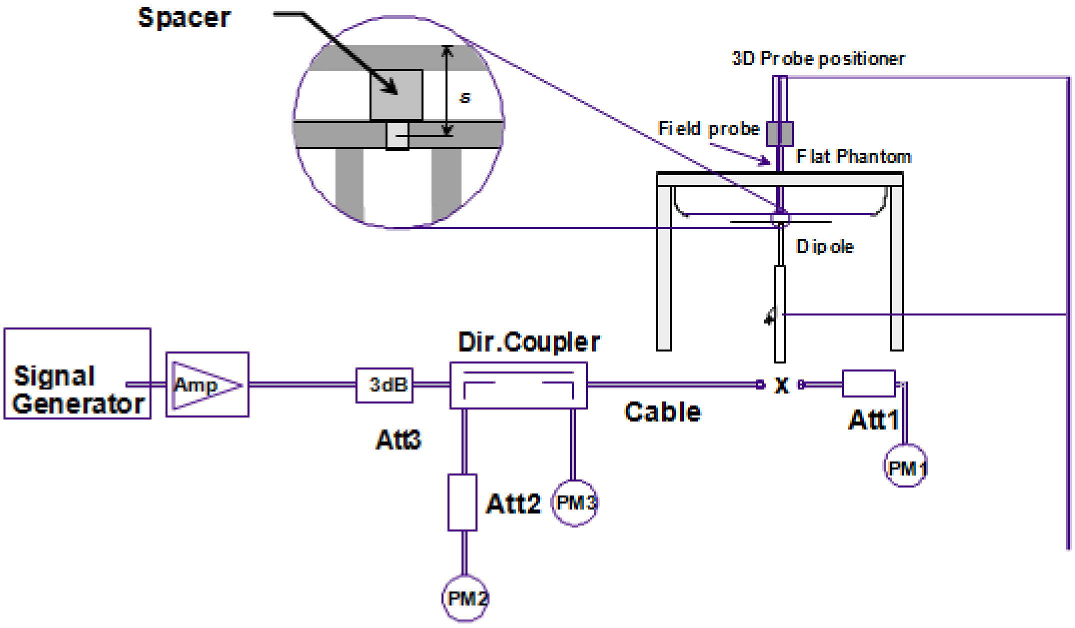
Dielectric parameters of the Tissue-equivalent liquids were measured before testing using the dielectric probe kit and the Network Analyzer. The measurement is carried out following the Agilent 85070 dielectric probe software instruction. A calibration of the probe open in air, probe with shorting block and probe in water is performed before measurement. After calibration, Insert the probe into the tissue liquid, trigger a measurement on software interface and record the data.

Body Tissue-equivalent liquid measurements:

f/MHz	Date Tested	Dielectric Parameters	Target	Delta (%)	Tolerance (%)	Temp (ºC)
2450	2014/5/22	ε_r =51.4	52.7	-2.47%	±5	22
		σ =1.98	1.95	1.54%		
2437	2014/5/22	ε_r =50.719	52.7	-3.76%	±5	22
		σ =2.011	1.95	3.13%		
2412	2014/5/22	ε_r =51.2	52.7	-2.85%	±5	22
		σ =2.00	1.95	2.56%		
2462	2014/5/22	ε_r =51.3	52.7	-2.66%	±5	22
		σ =1.974	1.95	1.23%		

5.4.3 System Checking

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



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

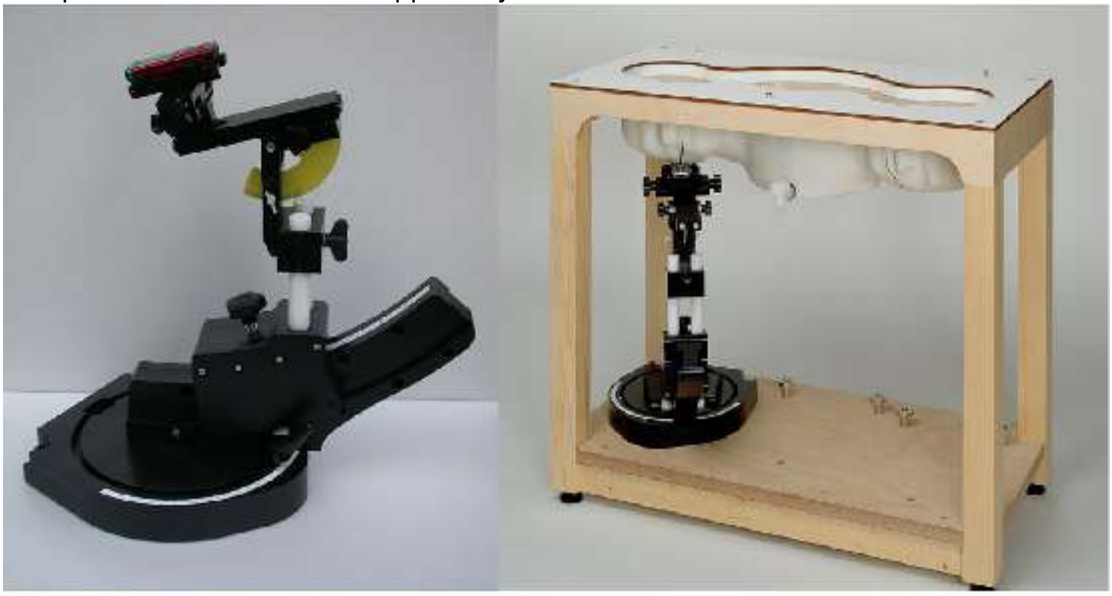
System checking, Body Tissue-equivalent liquid:

f/MHz	Date Tested	SAR(W/kg), 1g	Target	Delta(%)	Tolerance (%)	Temp (ºC)
2450	2014/5/22	48.8	50.8	-3.94%	±10	22

Plots of the system checking scans are given in Appendix A.

5.5 Device Holder

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



5.6 Test Position

5.6.1 Against Phantom Head

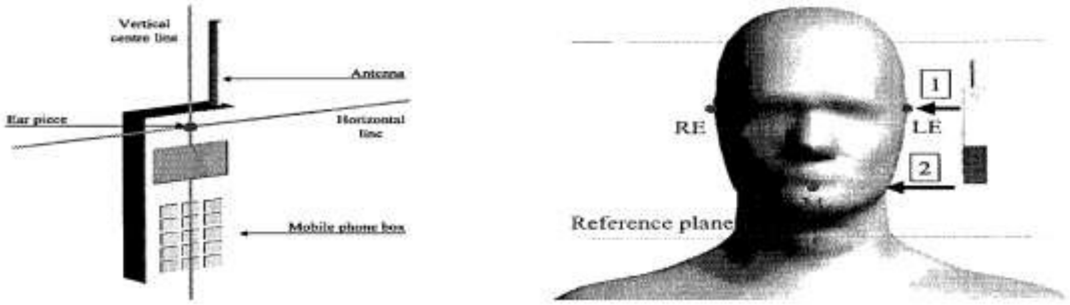
The Mobile phone shall be tested in the “cheek” and “tilted” position on left and right sides of the phantom.
Define of the “cheek” position:

a) Position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M, RE and LE) and align the center of the ear piece with the line RE-LE.
b) Translate the mobile phone box towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone

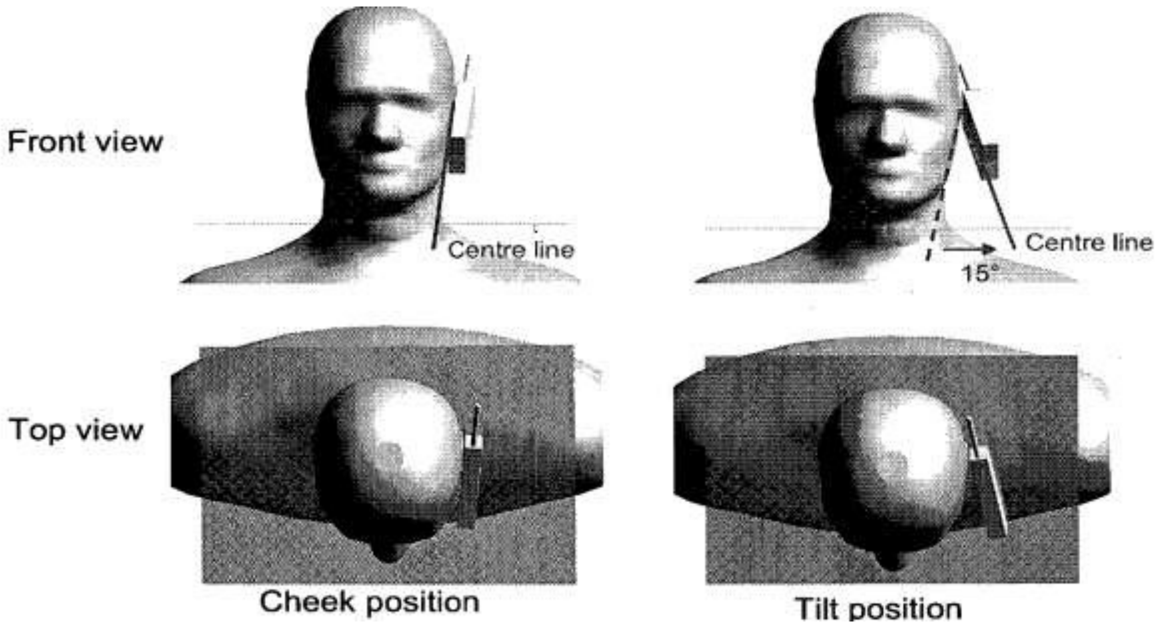
until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.

Define of the "tilted" position:

a) Position the device in the "cheek" position described above.
b) While maintaining the device the reference planes described above and pivoting against the ear, move it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.



Define of the reference lines and points,
on the phone and on the phantom and initial position



"Cheek" and "tilted" position of the mobile phone on the left side

5.6.2 Body Worm Configuration

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. The distance between of the device and the phantom was kept 15mm.

5.7 Scan Procedures

First, area scans were used for determination of the field distribution. Next, a zoom scan, a minimum of 5x5x7 points covering a volume of at least 30x30x30mm, was performed around the highest E-field value to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.

5.8 SAR Averaging Methods

The DASY5 software includes all numerical procedures necessary to evaluate the spatial peak SAR values. The base for the evaluation is a “cube” measurement in a volume of (30mm)3 (7x7x7 points). The maximum SAR value was averaged over the cube of tissue using interpolation and extrapolation.
The interpolation, extrapolation and maximum search routines within Dasy5 are all based on the modified Quadratic Shepard’s method.
The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighbouring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.
In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

6. Measurement uncertainty

6.1 Uncertainty for SAR Test

Uncertainty Budget of DASY for frequency range 300 MHz to 3 GHz

Uncertainty Component	Tol. (%)	Prob Dist.	Div	ci (1g)	ci.ui(%) (1g)	vi
Measurement System						
Probe Calibration	±5.9	N	1	1	±5.9	∞
Axial Isotropy	±4.7	R	$\sqrt{3}$	0.7	±1.9	∞
Hemispherical Isotropy	±9.6	R	$\sqrt{3}$	0.7	±3.9	∞
Boundary Effect	±1.0	R	$\sqrt{3}$	1	±0.6	∞
Linearity	±4.7	R	$\sqrt{3}$	1	±2.7	∞
System Detection Limits	±1.0	R	$\sqrt{3}$	1	±0.6	∞
Readout Electronics	±0.3	N	1	1	±0.3	∞
Response Time	±0.8	R	$\sqrt{3}$	1	±0.5	∞
Integration Time	±2.6	R	$\sqrt{3}$	1	±1.5	∞
RF Ambient Conditions - Noise	±3.0	R	$\sqrt{3}$	1	±1.7	∞
RF Ambient Conditions - Reflections	±3.0	R	$\sqrt{3}$	1	±1.7	∞
Probe Positioner Mechanical Tolerance	±0.4	R	$\sqrt{3}$	1	±0.2	∞
Probe Positioning with respect to Phantom Shell	±2.9	R	$\sqrt{3}$	1	±1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	±1.0	R	$\sqrt{3}$	1	±0.6	∞
Test Sample Related						
Test Sample Positioning	±2.9	N	1	1	±2.9	145
Device Holder Uncertainty	±3.6	N	1	1	±3.6	5
Output Power Variation - SAR drift measurement	±5.0	R	$\sqrt{3}$	1	±2.9	∞
Phantom and Tissue Parameters						
Phantom Uncertainty (shape and thickness tolerances)	±4.0	R	$\sqrt{3}$	1	±2.3	∞
Conductivity Target - tolerance	±5.0	R	$\sqrt{3}$	0.43	±1.2	∞
Conductivity - measurement uncertainty	±2.5	N	1	0.43	±1.1	∞
Permittivity Target - tolerance	±5.0	R	$\sqrt{3}$	0.49	±1.4	∞
Permittivity - measurement uncertainty	±2.5	N	1	0.49	±1.2	5
Combined Standard Uncertainty					**±10.7**	**387**
Expanded STD Uncertainty					**±21.4**	

6.2 Uncertainty for System Validation

Uncertainty Component	Uncert. value	Prob. Dist.	Div.	(ci) (1g)	Std. Unc. (1g)	(vi) veff
Probe Calibration	±6.55 %	N	1	1	±6.55 %	1
Axial Isotropy	±4.7 %	R	$\sqrt{3}$	1	±2.7 %	1
Hemispherical Isotropy	±9.6 %	R	$\sqrt{3}$	0	±0 %	1
Boundary E_ects	±1.0 %	R	$\sqrt{3}$	1	±0.6 %	1
Linearity	±4.7 %	R	$\sqrt{3}$	1	±2.7 %	1
System Detection Limits	±1.0 %	R	$\sqrt{3}$	1	±0.6 %	1
Modulation Response	±0 %	R	$\sqrt{3}$	1	±0 %	1
Readout Electronics	±0.3 %	N	1	1	±0.3 %	1
Response Time	±0 %	R	$\sqrt{3}$	1	±0 %	1
Integration Time	±0 %	R	$\sqrt{3}$	1	±0 %	1
RF Ambient Noise	±1.0 %	R	$\sqrt{3}$	1	±0.6 %	1
RF Ambient Re ections	±1.0 %	R	$\sqrt{3}$	1	±0.6 %	1
Probe Positioner	±0.8 %	R	$\sqrt{3}$	1	±0.5 %	1
Probe Positioning	±6.7 %	R	$\sqrt{3}$	1	±3.9 %	1
Max. SAR Eval.	±2.0 %	R	$\sqrt{3}$	1	±1.2 %	1
Dipole Related						
Deviation of exp. dipole	±5.5 %	R	$\sqrt{3}$	1	±3.2 %	1
Dipole Axis to Liquid Dist.	±2.0 %	R	$\sqrt{3}$	1	±1.2 %	1
Input power & SAR drift	±3.4 %	R	$\sqrt{3}$	1	±2.0 %	1
Phantom and Setup						
Phantom Uncertainty	±4.0 %	R	$\sqrt{3}$	1	±2.3 %	1
SAR correction	±1.9 %	R	$\sqrt{3}$	0.84	±0.9 %	1
Liquid Conductivity (meas.)	±2.5 %	N	1	0.71	±1.8 %	1
Liquid Permittivity (meas.)	±2.5 %	N	1	0.26	±0.7 %	1
Temp. unc. -Conductivity	±1.7 %	R	$\sqrt{3}$	0.71	±0.7 %	1
Temp. unc. -Permittivity	±0.3 %	R	$\sqrt{3}$	0.26	±0.0 %	∞
Combined Std. Uncertainty					±10.1 %	
Expanded STD Uncertainty					±20.1 %	

7. Conducted Test Results

WLAN 2.4GHz Band Conducted Power:

802.11b Average Power (dBm)					
Channel	Frequency(MHz)	Data Rate (bps)			
		1M bps	2M bps	5.5M bps	11M bps
CH 01	2,412	12.36	12.51	13.27	14.11
CH 06	2,437	11.98	12.00	13.48	13.69
CH 11	2,462	11.60	11.69	13.84	13.34

802.11g Average Power (dBm)							
Channel	Frequency(MHz)	Data Rate (bps)					
		6M bps	9M bps	12M bps	36M bps	48M bps	54M bps
CH 01	2,412	10.10	10.06	10.44	11.52	11.00	11.73
CH 06	2,437	10.49	10.52	10.61	11.15	11.21	11.37
CH 11	2,462	10.76	10.32	10.94	10.00	11.62	11.12

802.11n-HT20 Average Power (dBm)									
Channel	Frequency (MHz)	Data Rate (bps)							
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
CH 01	2,412	10.50	10.27	10.01	10.67	11.44	11.54	10.91	11.70
CH 06	2,437	10.32	10.56	10.61	11.03	11.09	11.10	11.35	11.35
CH 11	2,462	10.11	10.74	10.35	11.40	10.75	10.04	11.60	10.97

Remark:

1. Per KDB 248227 D01 v01r02, choose the highest output power channel to test SAR and determine further SAR exclusion
2. For each frequency band, testing at higher data rates and higher order modulations is not required when the maximum average output power for each of these configurations is less than 1/4dB higher than those measured at the lowest data rate. 2.4GHz WLAN SAR was tested on 802.11b 11Mbps.
3. Per KDB 248227 D01 v01r02, 11g and 11n-HT20 output power is less than 1/4dB higher than 11b mode, thus the SAR can be excluded.

Bluetooth 2.4GHz Band BDR Conducted Power:

Channel	Frequency(MHz)	DH1 Average Power (dBm)	DH3 Average Power (dBm)	DH5 Average Power (dBm)
CH 0	2,402	-5.00	-5.38	-5.00
CH 39	2,441	-5.13	-5.13	-5.13
CH 78	2,480	-5.37	-5.00	-5.39

Bluetooth 2.4GHz Band EDR Conducted Power:

Channel	Frequency(MHz)	DH1 Average Power (dBm)	DH3 Average Power (dBm)	DH5 Average Power (dBm)
CH 0	2,402	-8.57	-8.95	-8.61
CH 39	2,441	-8.70	-8.73	-8.74
CH 78	2,480	-8.94	-8.60	-8.90

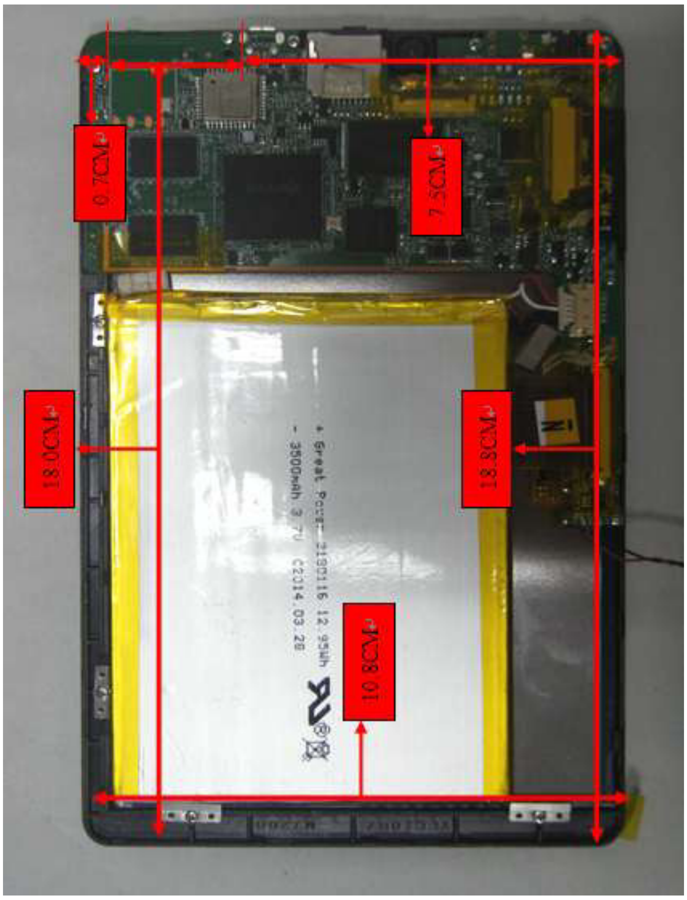
Bluetooth 2.4GHz Band LE mode Conducted Power:

Channel	Frequency(MHz)	Average Power (dBm)
CH 0	2,402	0.05
CH 39	2,441	0.35
CH 78	2,480	0.45

According to KDB 447498 D01 v05r01, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min.test separation distance, mm)]*[$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR

The maximum output power of Bluetooth is 0.45dBm(0.68mW), and the minimum separation distance is 5mm, hence the exclusion thresholds is 0.32 < 3.0, therefore RF exposure evaluation is not required for Bluetooth.

8. Exposure Positions Consideration



Distance of the Antenna to the EUT surface/edge						
Antennas	**Back**	**Front**	**Top Side**	**Bottom Side**	**Right Side**	**Left Side**
WLAN 2.4GHz Band	≤ 25mm	≤ 25mm	≤25mm	>25mm	>25mm	≤25mm

Positions for SAR tests; Hotspot mode						
Antennas	**Back**	**Front**	**Top Side**	**Bottom Side**	**Right Side**	**Left Side**
WLAN 2.4GHz Band	Yes	Yes	Yes	NO	NO	Yes

Remark:
1 According to KDB 447498 D01v05, for handsets the test separation distance is typically according to the smallest test separation distance required for the group of body-worn accessories with similar operating and exposure characteristics. Which is 0mm for head SAR, 0mm for body-worn SAR for the DUT.

2 For minimum test separation distance ≤50mm, Bluetooth standalone SAR test exclusion power threshold is determined by: [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

Exposure Position	Wireless Interface	**Bluetooth**
	Tune-up Maximum power (dBm)	0.5
	Tune-up Maximum rated power (mW)	1.12
Body 0 cm	Antenna to user (mm)	5
	SAR exclusion threshold (mW)	10
	SAR testing required	No

9. SAR Test Results

Remark:

1. Per KDB 447498 D01v05, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance. Scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units. Reported SAR(W/kg)= Measured SAR(W/kg)* Scaling Factor
2 Per KDB 447498 D01v05, for each exposure position, if the mid channel or highest output channel reported SAR ≤0.8W/kg, other channels SAR testing are not necessary
3 Per KDB 941225 D06v01r01, when the same wireless mode and device transmission configurations are required for testing body-worn accessories and hotspot mode, it is not necessary to test body-worn accessory SAR for the same device orientation if the test separation distance for hotspot mode is more conservative than that used for body-worn

9.1 WiFi SAR results

WIFI Body
Distance 0mm

Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Scaling Factor	Measured SAR (W/kg)	Reported SAR (W/kg)
WiFi 2.4G	11b	Back	6	2437	13.69	14.5	1.205	0.982	1.183
WiFi 2.4G	11b	Back	1	2412	14.11	14.5	1.094	1.08	1.182
WiFi 2.4G	11b	Back	11	2462	13.34	14.5	1.306	1.00	1.306
WiFi 2.4G	11b	Front	6	2437	13.69	15	1.205	0.521	0.628
WiFi 2.4G	11b	Top	6	2437	13.69	15	1.205	0.349	0.421
WiFi 2.4G	11b	Left side	6	2437	13.69	15	1.205	0.163	0.196

9.2 Repeated SAR results

Remark:
1 According to KDB 865664 D01v01, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2 KDB 865664 D01v01, if the deviation among the repeated measurement is ≤20% and the measured SAR<1.45W/kg, only one repeated measurement is required.
3 The variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium.
Measured SAR of all frequency band are lower than 0.8W/kg, repeated SAR is not required.

10. SYSTEM CHECKING SCANS

SystemPerformanceCheck-D2450 Body:

Date: 2014.5. 22.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:818

Communication System: CW; Communication System Band: Not Specified; Frequency: 2450 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

Probe: ES3DV3 - SN3203; ConvF (4.72, 4.72,4.72); Calibrated: 2013.10.31.

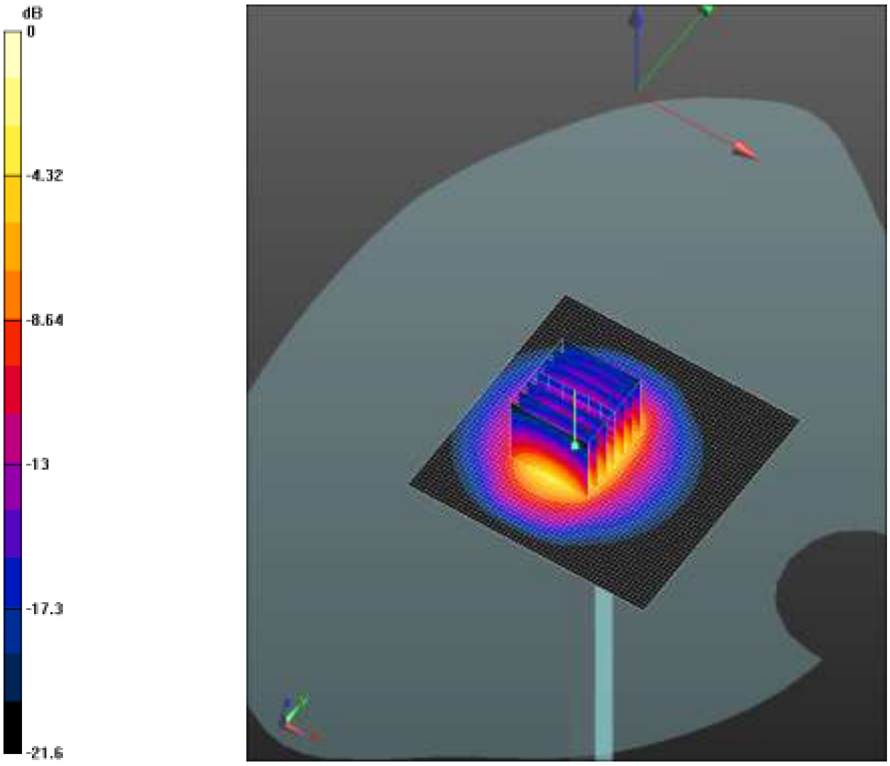
Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn876; Calibrated: 2013.10.31.

Phantom: SAM 1; Type: QD000P40CC; Serial: TP:1504

Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 18.3 W/kg
Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 82.205 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 24.691 mW/g
SAR(1 g) = 12.2 mW/g; SAR(10 g) = 5.72 mW/g
Maximum value of SAR (measured) = 18.4 W/kg



0 dB = 18.4 W/kg

11. System Validation

Per KDB 865664 D02v01, SAR system validation status should be documented to confirm measurement accuracy. SAR measurement systems are validated according to procedures in KDB 865664 D01v01. The validation status is documented according to the validation date(s), measurement frequencies, SAR probe and tissue dielectric parameters. When multiple SAR system is used, the validation status of each SAR system is needed to be documented separately according to the associated system components.
A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probe and tissue dielectric parameters are shown as below.

Date	Probe S/N	Tested Freq MHz	Tissue	CW			Mod. Validation		
				Sensitivity	Linearity	Isotropy	Mod	Duty Factor	Peak to Average Power Ration
2013-11-16	3203	2450	Body	Pass	Pass	Pass	OFDM	Pass	N/A

12. Measurement Scans

Date: 2014.05.22.

Test Laboratory: SMQ SAR Test

NS-15AT07 WiFi 802.11b Body Front Mid

DUT: default; Type: default;
Communication System: 802.11b WiFi 2.4GHz (DSSS, 11Mbps); Communication System Band: 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:2.29034
Medium parameters used (interpolated): f = 2437 MHz; σ = 2.011 mho/m; ε_r = 50.719; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

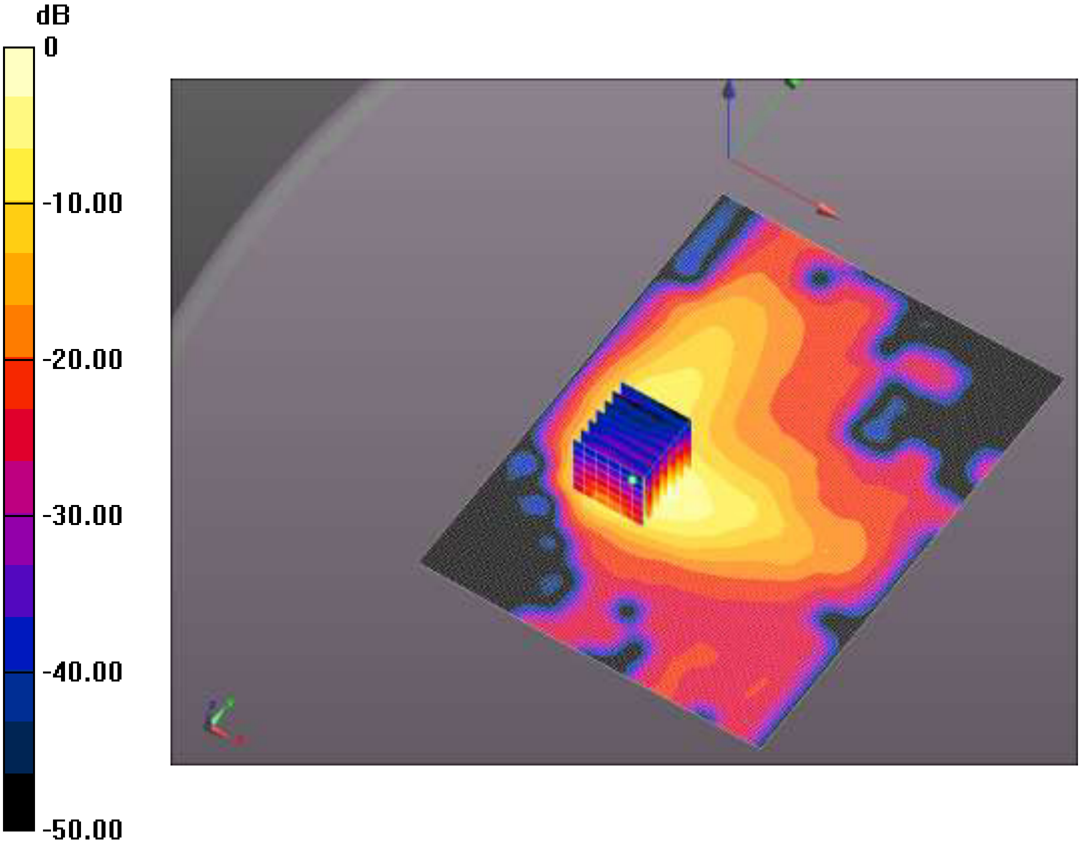
- Probe: ES3DV3 - SN3203; ConvF (4.72, 4.72, 4.72); Calibrated: 2013.10.31.;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn876; Calibrated: 2014.03.03.
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

802.11b-0mm/Faceup-Mid/Area Scan (121x161x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Reference Value = 3.358 V/m; Power Drift = -0.39 dB
Fast SAR: SAR(1 g) = 0.507 mW/g; SAR(10 g) = 0.230 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.622 W/kg

802.11b-0mm/Faceup-Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.358 V/m; Power Drift = -0.39 dB
Peak SAR (extrapolated) = 1.335 mW/g
SAR(1 g) = 0.521 mW/g; SAR(10 g) = 0.213 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.587 W/kg



0 dB = 0.622 W/kg = -4.13 dB W/kg

Date: 2014.05.22.

Test Laboratory: SMQ SAR Test

NS-15AT07 WiFi 802.11b Body Rear Low

DUT: default; Type: default;

Communication System: 802.11b WiFi 2.4GHz (DSSS, 11Mbps); Communication System Band: 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:2.29034
Medium parameters used (interpolated): f = 2412 MHz; σ = 2.000 mho/m; ε_r = 51.200; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: ES3DV3 - SN3203; ConvF (4.72, 4.72, 4.72); Calibrated: 2013.10.31.;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn876; Calibrated: 2014.03.03.
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

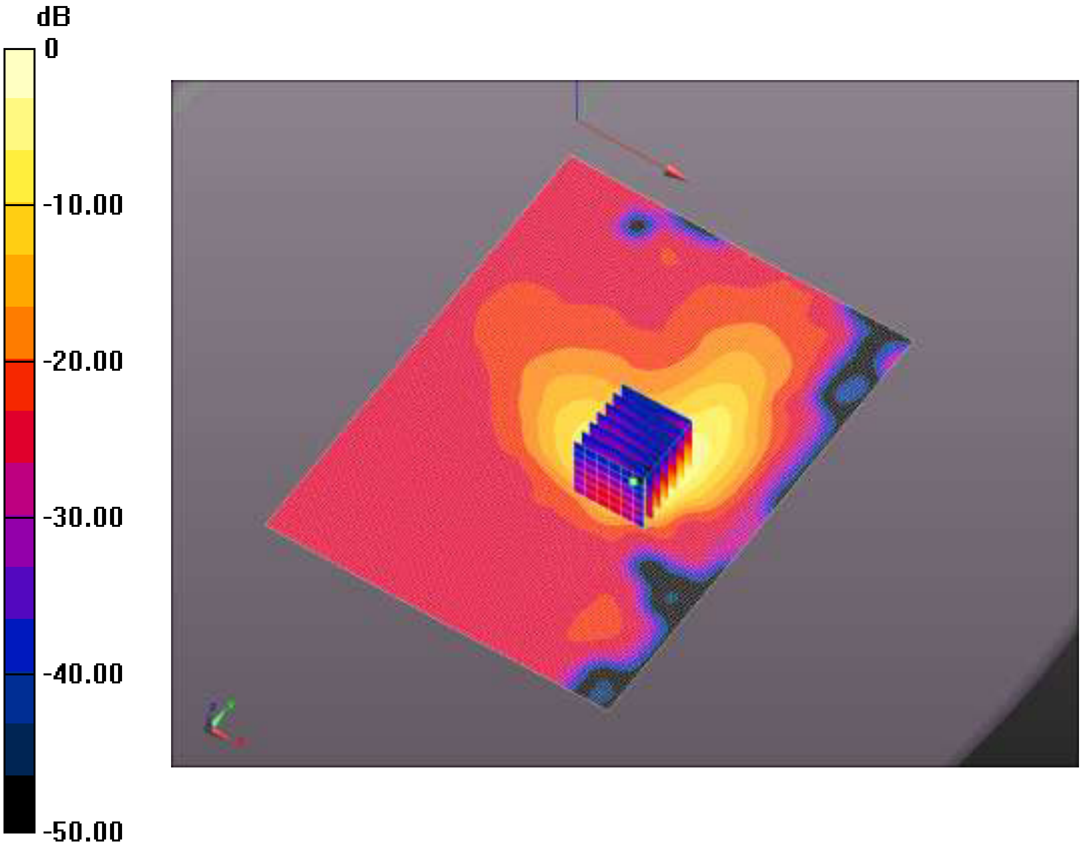
802.11b-0mm/Facedown-Low/Area Scan (121x161x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Reference Value = 7.564 V/m; Power Drift = -0.09 dB
Fast SAR: SAR(1 g) = 0.886 mW/g; SAR(10 g) = 0.381 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.33 W/kg

802.11b-0mm/Facedown-Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.564 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 3.345 mW/g
SAR(1 g) = 1 mW/g; SAR(10 g) = 0.374 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.28 W/kg



0 dB = 1.33 W/kg = 2.46 dB W/kg

Date: 2014.05.22.

Test Laboratory: SMQ SAR Test

NS-15AT07 WiFi 802.11b Body Rear Mid

DUT: default; Type: default;

Communication System: 802.11b WiFi 2.4GHz (DSSS, 11Mbps); Communication System Band: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:2.29034
Medium parameters used (interpolated): f = 2437 MHz; σ = 2.011 mho/m; ε_r = 50.719; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: ES3DV3 - SN3203; ConvF (4.72, 4.72, 4.72); Calibrated: 2013.10.31.;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn876; Calibrated: 2014.03.03.
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

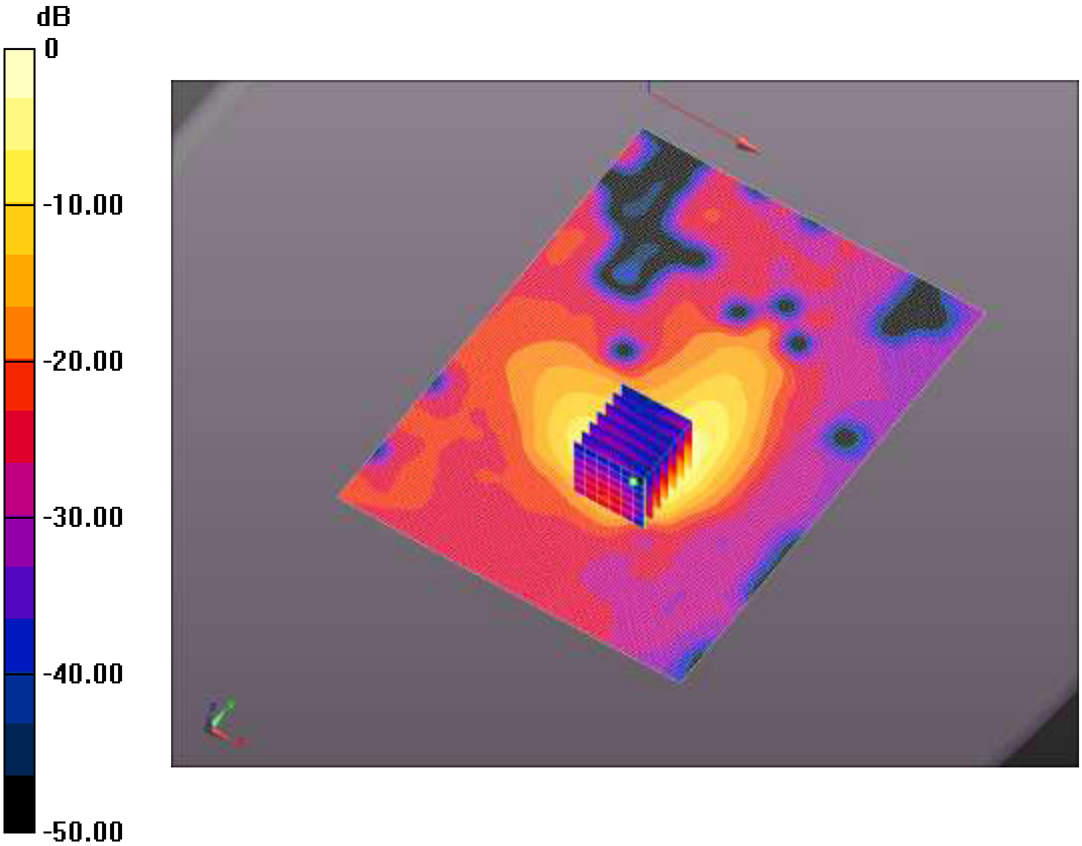
802.11b-0mm/Facedown-Mid/Area Scan (121x161x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Reference Value = 3.281 V/m; Power Drift = 0.78 dB
Fast SAR: SAR(1 g) = 0.850 mW/g; SAR(10 g) = 0.374 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.25 W/kg

802.11b-0mm/Facedown-Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.281 V/m; Power Drift = 0.78 dB
Peak SAR (extrapolated) = 3.027 mW/g
SAR(1 g) = 0.982 mW/g; SAR(10 g) = 0.372 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.19 W/kg



0 dB = 1.25 W/kg = 1.95 dB W/kg

Date: 2014.05.22.

Test Laboratory: SMQ SAR Test

NS-15AT07 WiFi 802.11b Body Rear High

DUT: default; Type: default;

Communication System: 802.11b WiFi 2.4GHz (DSSS, 11Mbps); Communication System Band: 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:2.29034
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.974 mho/m; ε_r = 51.300; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

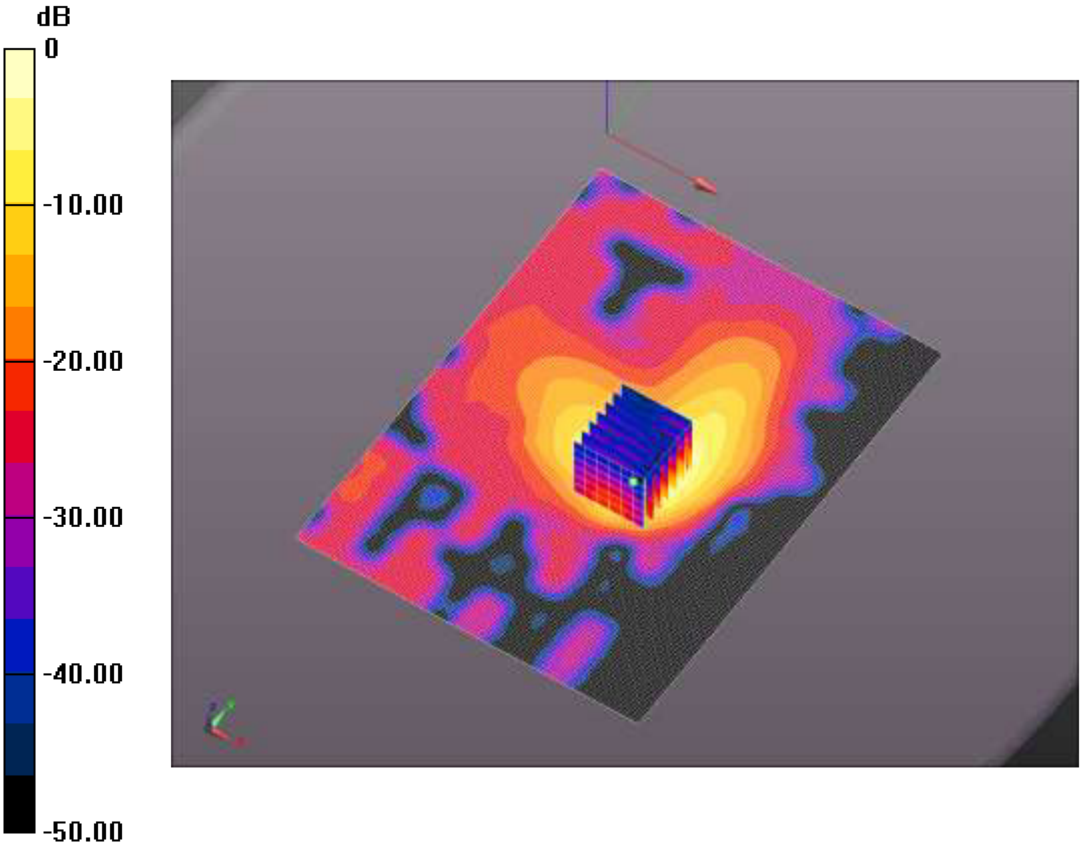
- Probe: ES3DV3 - SN3203; ConvF (4.72, 4.72, 4.72); Calibrated: 2013.10.31.;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn876; Calibrated: 2014.03.03.
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

802.11b-0mm/Facedown-High/Area Scan (121x161x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Reference Value = 8.703 V/m; Power Drift = 0.42 dB
Fast SAR: SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.443 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.54 W/kg

802.11b-0mm/Facedown-High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.703 V/m; Power Drift = 0.42 dB
Peak SAR (extrapolated) = 3.517 mW/g
SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.394 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.26 W/kg



0 dB = 1.54 W/kg = 3.75 dB W/kg

Date: 2014.05.22.

Test Laboratory: SMQ SAR Test

NS-15AT07 WiFi 802.11b Body Top Mid

DUT: default; Type: default;

Communication System: 802.11b WiFi 2.4GHz (DSSS, 11Mbps); Communication System Band: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:2.29034
Medium parameters used (interpolated): f = 2437 MHz; σ = 2.011 mho/m; ε_r = 50.719; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

- Probe: ES3DV3 - SN3203; ConvF (4.72, 4.72, 4.72); Calibrated: 2013.10.31.;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn876; Calibrated: 2014.03.03.
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

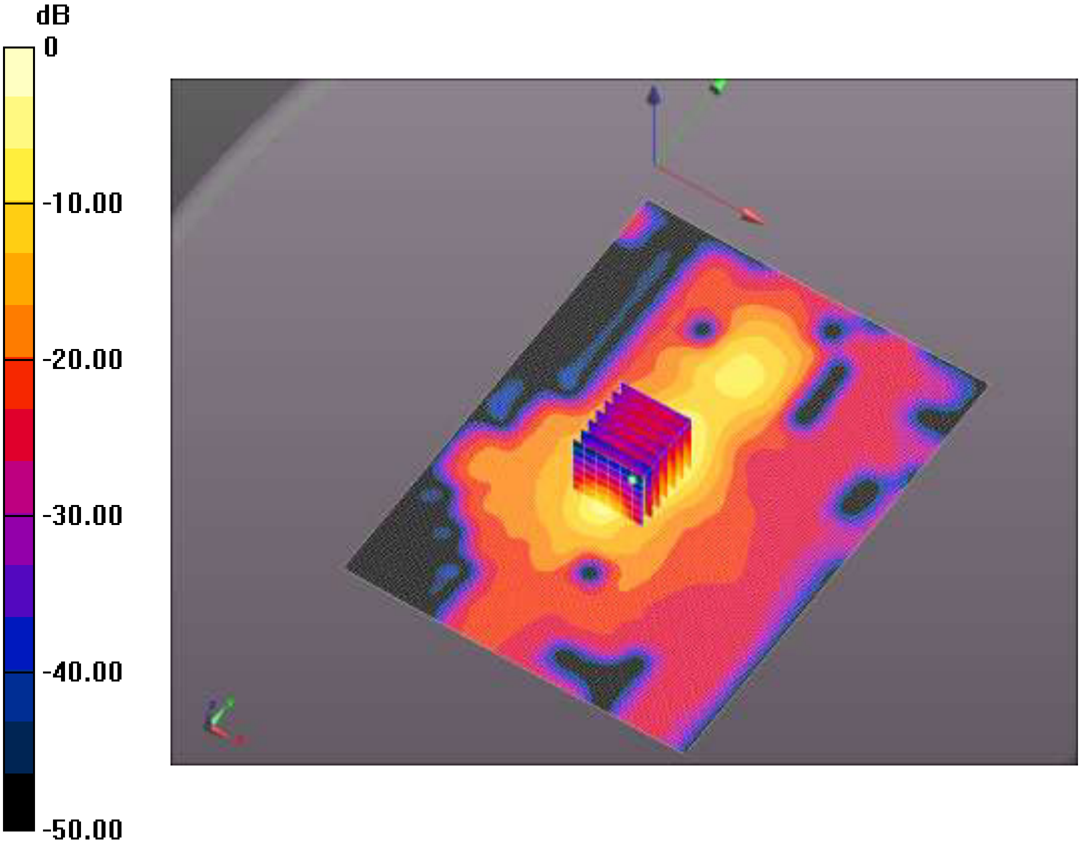
802.11b-0mm 2/top-Mid/Area Scan (121x161x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Reference Value = 13.325 V/m; Power Drift = -0.07 dB
Fast SAR: SAR(1 g) = 0.333 mW/g; SAR(10 g) = 0.144 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.436 W/kg

802.11b-0mm /top-Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.325 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.792 mW/g
SAR(1 g) = 0.349 mW/g; SAR(10 g) = 0.150 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.413 W/kg



0 dB = 0.436 W/kg = -7.20 dB W/kg

Date: 2014.05.22.

Test Laboratory: SMQ SAR Test

NS-15AT07 WiFi 802.11b Body Left Side Mid

DUT: default; Type: default;

Communication System: 802.11b WiFi 2.4GHz (DSSS, 11Mbps); Communication System Band: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:2.29034
Medium parameters used (interpolated): f = 2437 MHz; σ = 2.011 mho/m; ε_r = 50.719; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration:

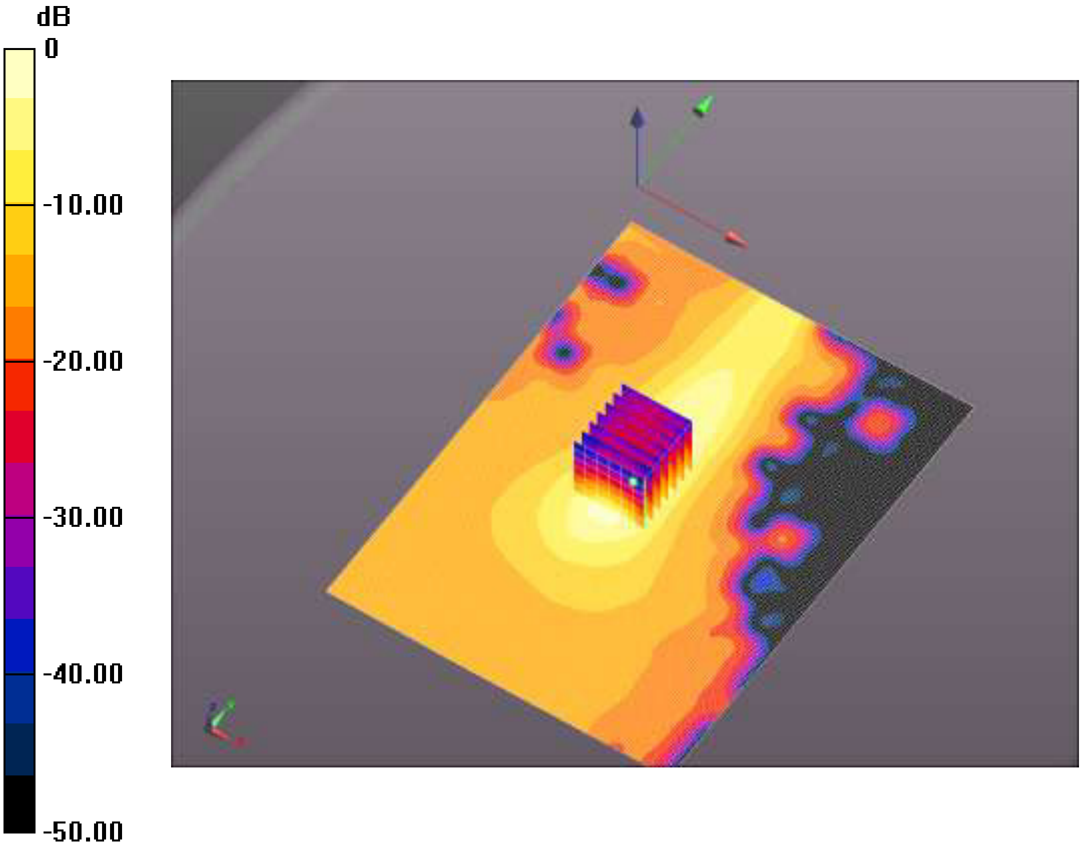
- Probe: ES3DV3 - SN3203; ConvF (4.72, 4.72, 4.72); Calibrated: 2013.10.31.;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn876; Calibrated: 2014.03.03.
- Phantom: ELI v4.0; Type: QDOVA001BB; Serial: TP:xxxx
- Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

802.11b-0mm /Left-Mid/Area Scan (121x161x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Reference Value = 9.470 V/m; Power Drift = 0.36 dB
Fast SAR: SAR(1 g) = 0.156 mW/g; SAR(10 g) = 0.073 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.187 W/kg

802.11b-0mm 2/Left-Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.470 V/m; Power Drift = 0.36 dB
Peak SAR (extrapolated) = 0.342 mW/g
SAR(1 g) = 0.163 mW/g; SAR(10 g) = 0.075 mW/g

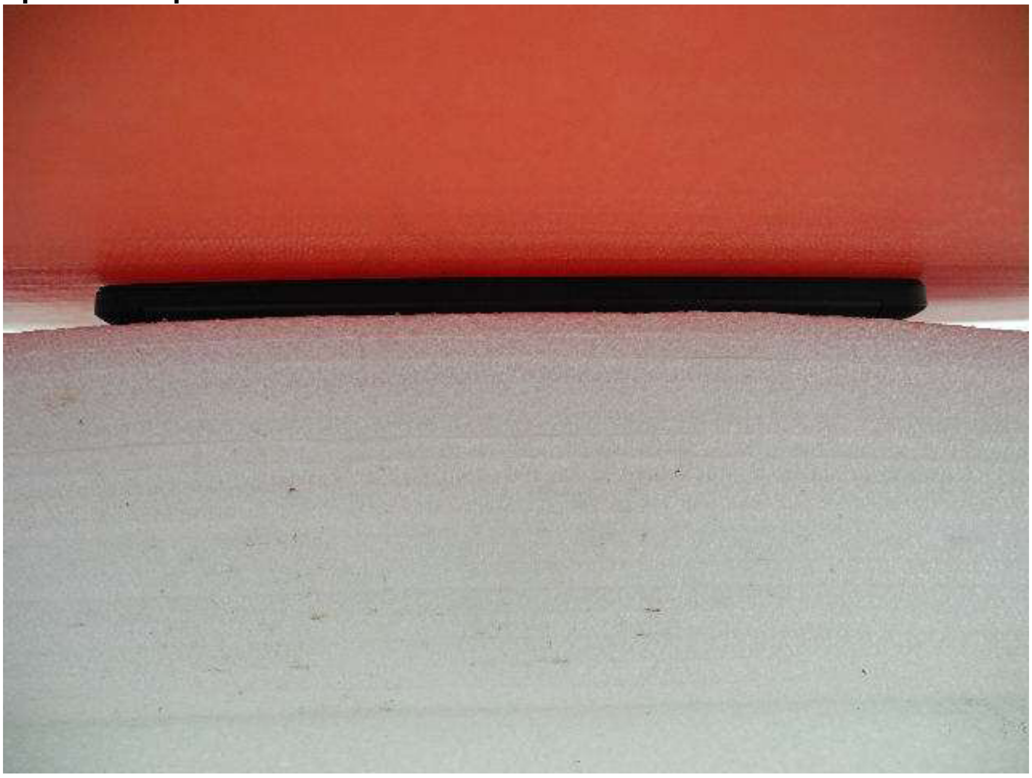
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.189 W/kg



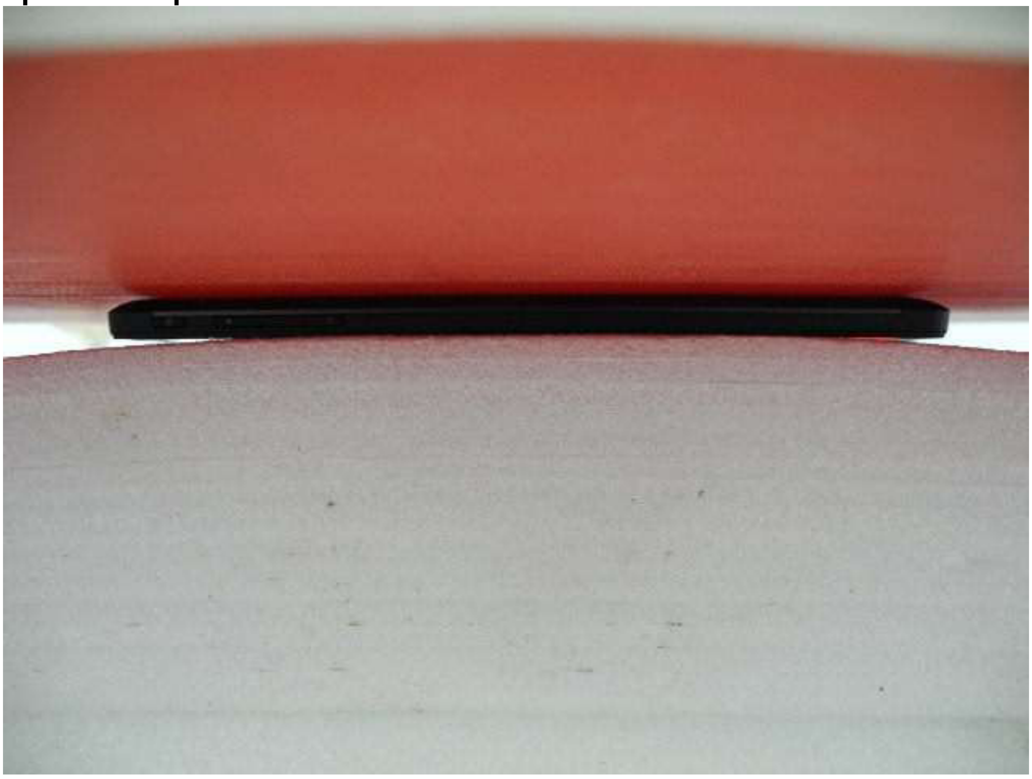
0 dB = 0.187 W/kg = -14.57 dB W/kg

13. Photographs of the Test Set-Up

Photograph 1: Set-up for Rear side



Photograph 2: Set-up for Front side



Photograph 3: Set-up for Top side

Photograph 4: Set-up for Left side

14. Relevant Pages from Probe Calibration Report

TMC In Collaboration with speag CALIBRATION LABORATORY

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E-mail: Info@emcite.com Http://www.emcite.com

ilac-MRA CNAS 校准 CNAS L0442

Client **SMQ** **Certificate No: J13-2-2921**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3203
Calibration Procedure(s)	TMC-OS-E-02-195 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	October 31, 2013

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(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
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-13 (TMC, No.JZ13-781)	Feb-14

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

Issued: November 4, 2013

TMC In Collaboration with s p e a g CALIBRATION LABORATORY

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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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003

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 ES3DV3

SN: 3203

Calibrated: October 31, 2013

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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DASY – Parameters of Probe: ES3DV3 - SN: 3203

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)²)[A]	1.30	1.26	1.11	±10.8%
DCP(mV)[B]	103.9	104.0	105.8	

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	200.4	±3.5%
		Y	0.0	0.0	1.0		184.0	
		Z	0.0	0.0	1.0		184.4	

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: ES3DV3 - SN: 3203

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	Depth (mm)	Unct. (k=2)
900	41.5	0.97	6.55	6.55	6.55	0.39	1.77	±12%
1810	40.0	1.40	5.41	5.41	5.41	0.31	2.22	±12%
2450	39.2	1.80	5.07	5.07	5.07	0.54	1.66	±12%

[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.

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DASY – Parameters of Probe: ES3DV3 - SN: 3203

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	Depth (mm)	Unct. (k=2)
900	55.0	1.05	6.75	6.75	6.75	2.14	0.90	±12%
1810	53.3	1.52	5.12	5.12	5.12	0.32	2.38	±12%
2450	52.7	1.95	4.72	4.72	4.72	0.64	1.49	±12%

[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.

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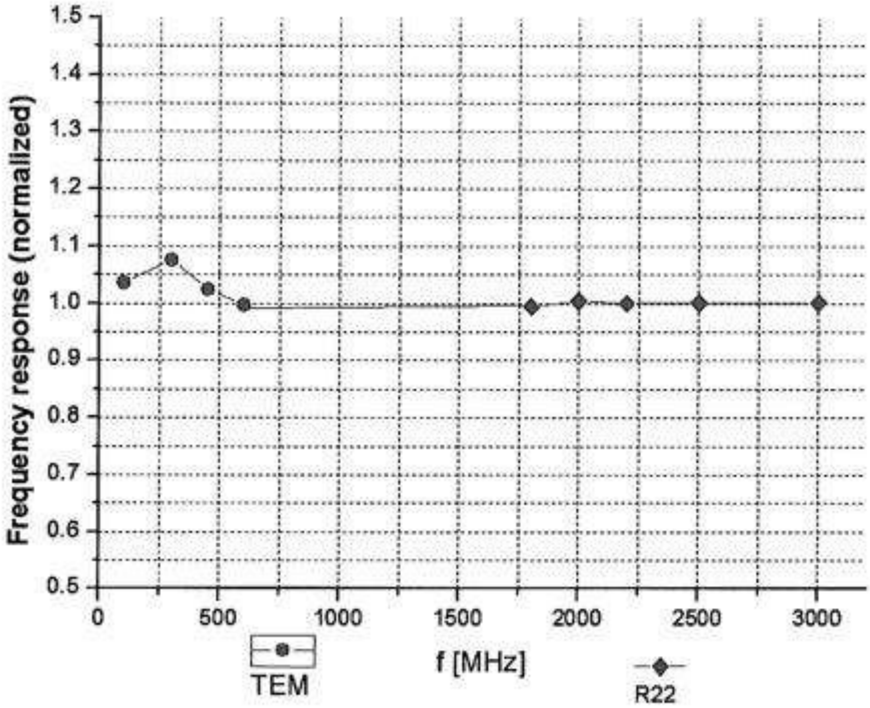
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



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

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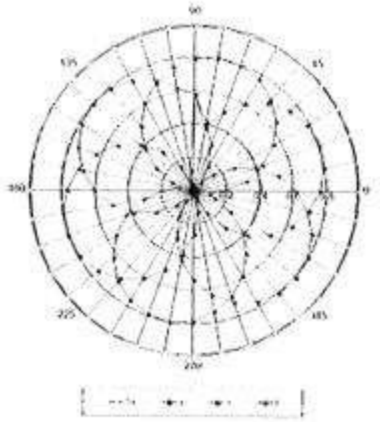
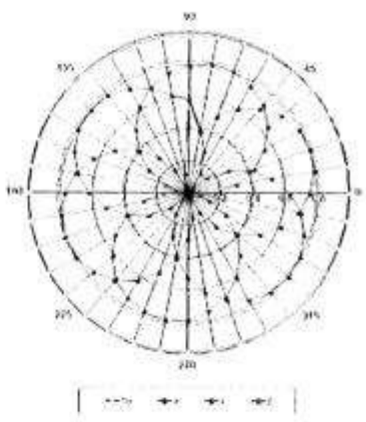
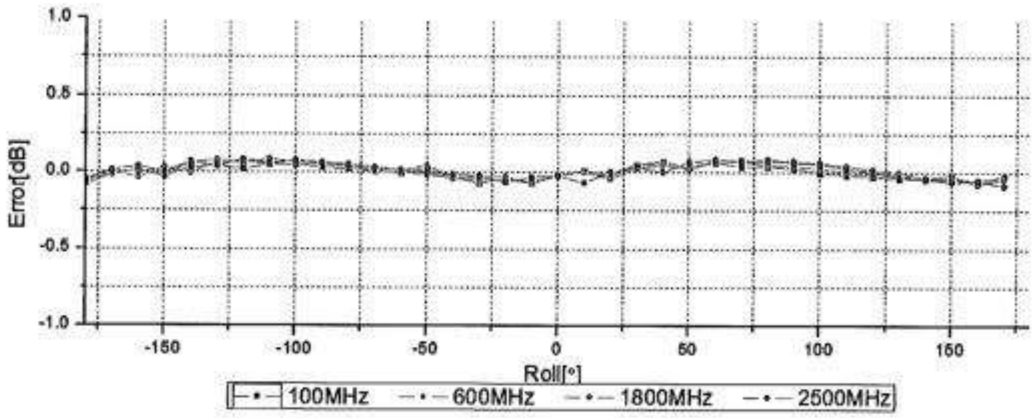
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





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

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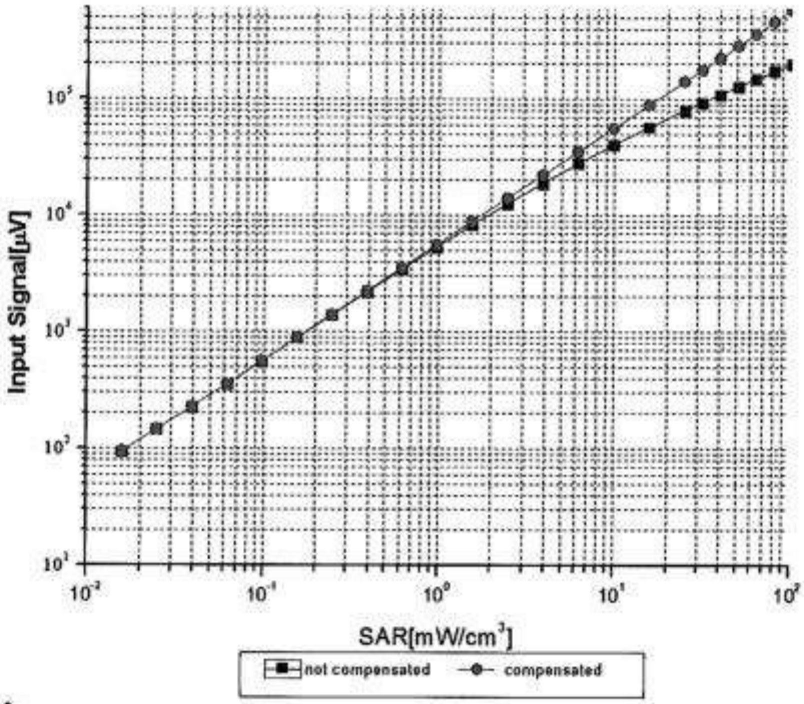
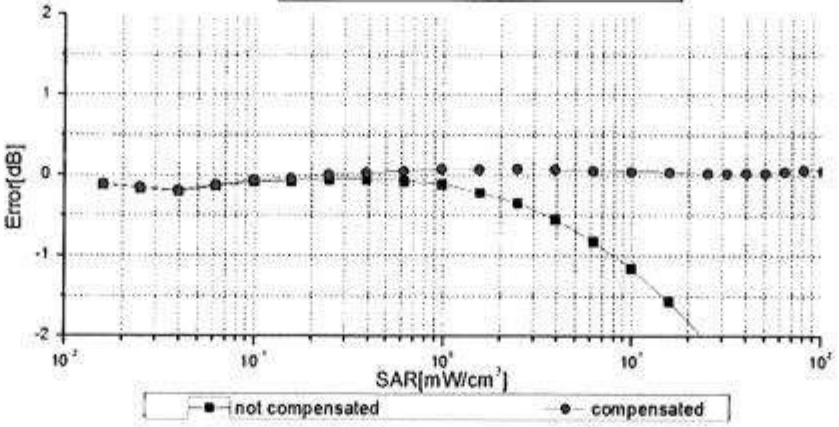
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





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

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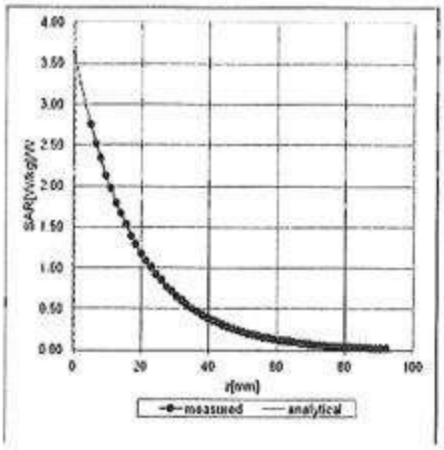
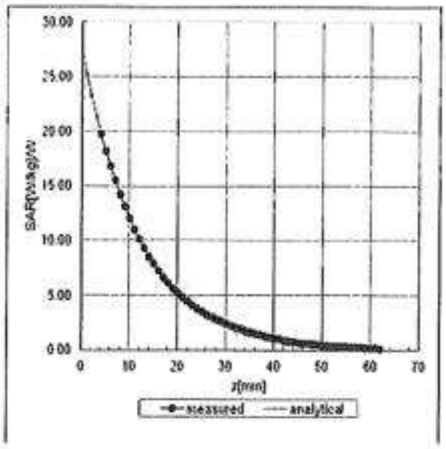
Conversion Factor Assessment

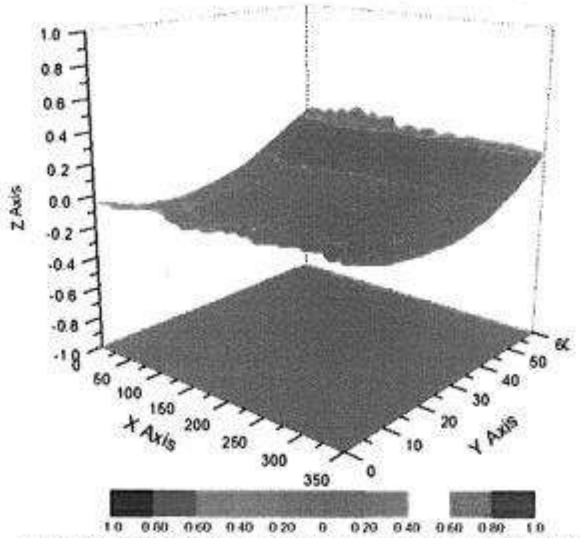
f=900 MHz, WGLS R9(H_convF)



f=1810 MHz, WGLS R22(H_convF)



Deviation from Isotropy in Liquid



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

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DASY - Parameters of Probe: ES3DV3 - SN: 3203

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	175
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	4mm
Probe Tip to Sensor X Calibration Point	2mm
Probe Tip to Sensor Y Calibration Point	2mm
Probe Tip to Sensor Z Calibration Point	2mm
Recommended Measurement Distance from Surface	3mm

15. Relevant Pages from Dipole Validation Kit Report

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

ilac-MRA

SWISS CALIBRATION

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S Swiss Calibration Service

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

Accreditation No.: SCS 108

Client **SMQ (Auden)**

Certificate No: D2450V2-818_Oct12

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 818
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	October 18, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 18, 2012

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

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
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	38.4 ± 6 %	1.85 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.5 W/kg ± 16.5 % (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	51.0 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.03 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.8 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.0 Ω + 2.5 jΩ
Return Loss	- 28.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.1 Ω + 4.4 jΩ
Return Loss	- 27.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.165 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
Manufactured on	December 11, 2008

DASY5 Validation Report for Head TSL

Date: 18.10.2012

Test Laboratory: SPEAG, Zurich, Switzerland

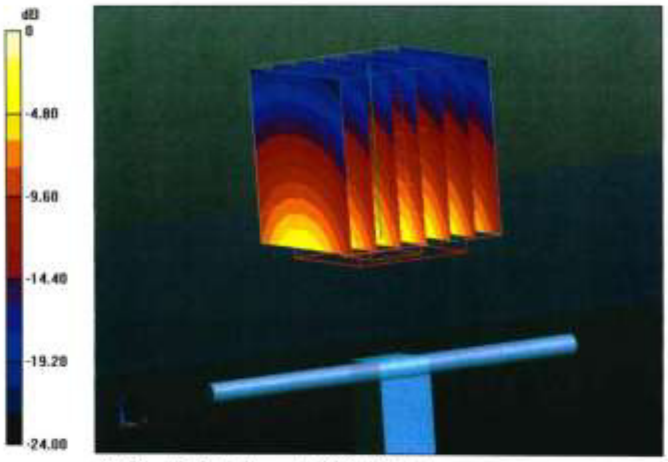
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 818

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.85 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

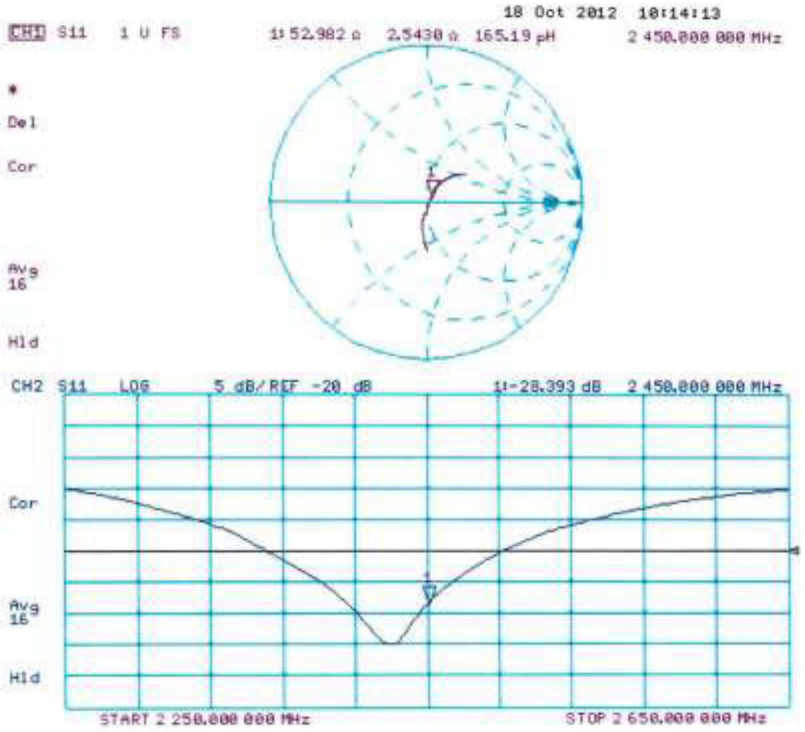
- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.551 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.19 W/kg
Maximum value of SAR (measured) = 17.0 W/kg



0 dB = 17.0 W/kg = 12.30 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 18.10.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 818

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma = 2.02$ mho/m; $\varepsilon_r = 51$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

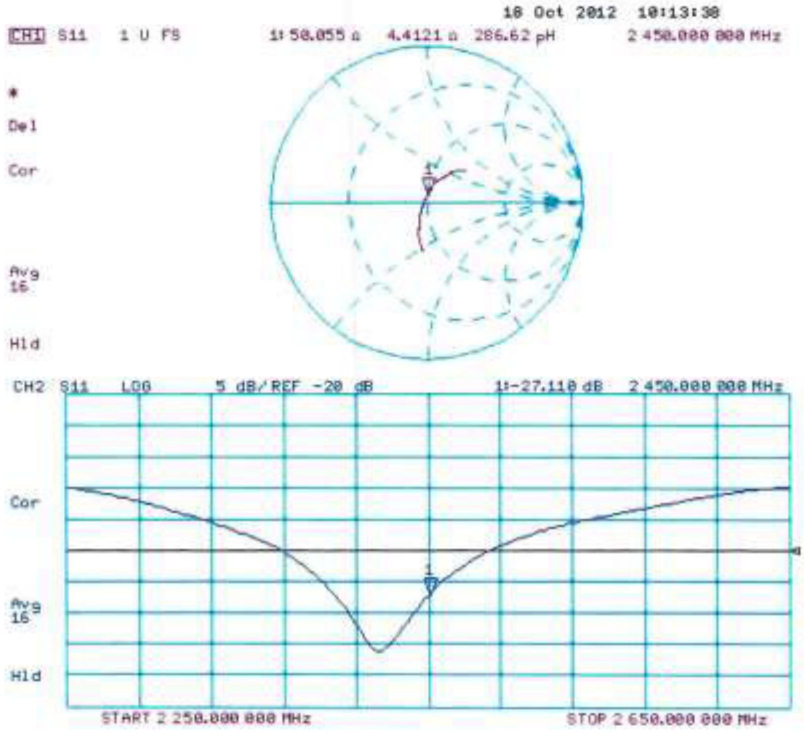
DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm 2/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.079 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 26.9 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 6.03 W/kg
Maximum value of SAR (measured) = 17.0 W/kg

0 dB = 17.0 W/kg = 12.30 dBW/kg

Impedance Measurement Plot for Body TSL

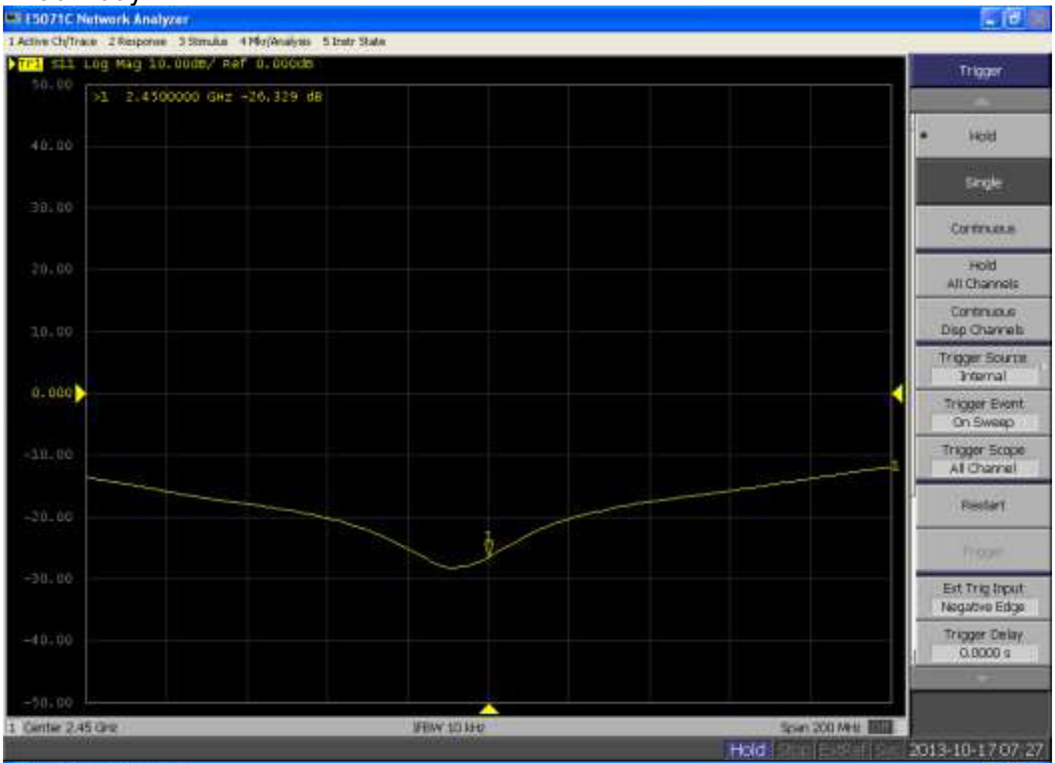


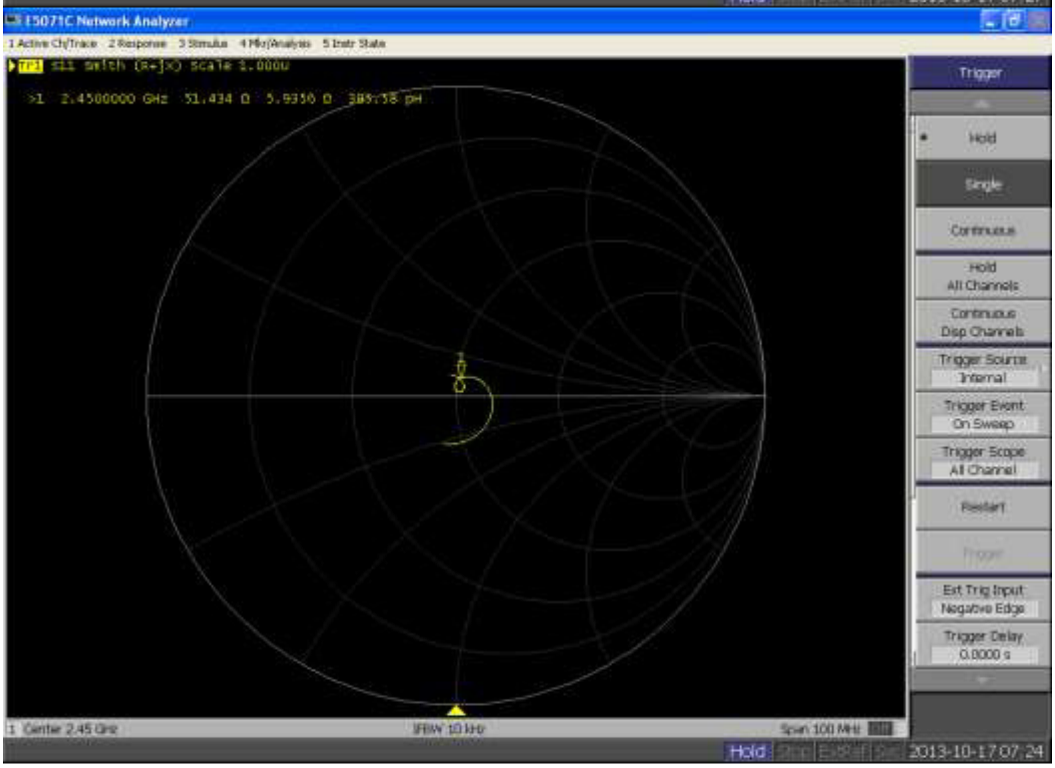
D2450V2, serial No. 818 Extended Dipole Calibrations
Referring to KDB 865664, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

Justification of the extended calibration

	2450 Body					
	Return-Loss (dB)	Delta(%)	Real Impedance(ohm)	Delta (ohm)	Imaginary Impedance(ohm)	Delta (ohm)
2013-10-18	-27.110		50.055		4.4121	
2013-10-17	-26.329	-2.88	51.434	1.38	5.9356	1.52

2450 Body


E5071C Network Analyzer
1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State
Tr1 S11 Log Mag 10.00dB/ Ref 0.000dB
>1 2.4500000 GHz -26.329 dB
50.00
40.00
30.00
20.00
10.00
0.000
-10.00
-20.00
-30.00
-40.00
-50.00
1 Center 2.45 GHz
IFBW 10 kHz
Span 200 MHz
Trigger
Hold
Single
Continuous
Hold All Channels
Continuous Disp Channels
Trigger Source Internal
Trigger Event On Sweep
Trigger Scope All Channel
Restart
Trigger
Ext Trig Input Negative Edge
Trigger Delay 0.0000 s
Hold
2013-10-17 07:27


E5071C Network Analyzer
1 Active Ch/Trace 2 Response 3 Stimulus 4 Mkr/Analysis 5 Instr State
Tr1 S11 Smith (R+jX) Scale 1.000U
>1 2.4500000 GHz 51.434 Ω 5.9356 Ω 385.58 pH
1 Center 2.45 GHz
IFBW 10 kHz
Span 100 MHz
Trigger
Hold
Single
Continuous
Hold All Channels
Continuous Disp Channels
Trigger Source Internal
Trigger Event On Sweep
Trigger Scope All Channel
Restart
Trigger
Ext Trig Input Negative Edge
Trigger Delay 0.0000 s
Hold
2013-10-17 07:24

16. List of Tables

17. List of Photographs