SAR TEST REPORT

Test Report No. : 11157080H-C

Applicant	:	**CASIO COMPUTER CO., LTD.**
Type of Equipment	:	**Digital Camera**
Model No.	:	**EX-FR200CA**
FCC ID	:	**BBQEXFR200CA**
Test regulation	:	**FCC47CFR 2.1093**
Test Result	:	**Complied**
Reported SAR(1g) Value		**The highest reported SAR(1g)** Body : 0.089 W/kg

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers SAR technical requirements. It does not cover administrative issues such as Manual or non-SAR test related Requirements. (if applicable)

Date of test: March 7, 2016

Representative test engineer: H. Sato

Hisayoshi Sato
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Takayuki Shimada
Engineer
Consumer Technology Division

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
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REVISION HISTORY

Original Test Report No.: 11157080H-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	11157080H-C	April 7, 2016	-	-

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SECTION 1: Customer information

Company Name	:	CASIO COMPUTER CO., LTD.
Address	:	2-1, Sakaecho 3-chome, Hamura-shi, Tokyo 205-8555, Japan
Telephone Number	:	+81-42-579-7282
Facsimile Number	:	+81-42-579-7702
Contact Person	:	Hiroaki Suzuki

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

<Information of the EUT>

Type of Equipment	:	Digital Camera
Model No.	:	EX-FR200CA
Serial No.	:	P115011000209
Rating	:	Li-ion Battery(NP-170) DC 3.7V, 950mAh, 3.6Wh
Receipt Date of Sample	:	February 27, 2016
Country of Mass-production	:	Indonesia
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product description

General Specification

Clock frequency(ies) in the system	:	48 MHz and 32.768 kHz for main system 37.4 MHz for WLAN and Bluetooth Low Energy module 26 MHz for Bluetooth classic module (Bluetooth 2.1+EDR(for IC241 of CP-1 circuit board))
Operating temperature	:	-5 deg. C to +40 deg. C

Radio Specification

<WLAN + Bluetooth Low Energy module>

WLAN (IEEE802.11b/g/n-20)

Equipment Type	Transceiver
Frequency of Operation	2412 MHz - 2462 MHz
Type of Modulation	DSSS, OFDM
Bandwidth & Channel spacing	20 MHz & 5 MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 1.2 V / DC 3.3 V
Antenna Type	Monopole Pattern Antenna
Antenna Gain	-3.3dBi

Bluetooth (Ver. 4.1 Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz - 2480 MHz
Type of Modulation	GFSK
Bandwidth & Channel spacing	2 MHz & 2 MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 1.2 V / DC 3.3 V
Antenna Type	Monopole Pattern Antenna
Antenna Gain	-3.3dBi

<Bluetooth classic module>

Bluetooth (Ver. 2.1 + EDR)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz - 2480 MHz
Type of Modulation	FHSS (GFSK, π/4DQPSK, 8DPSK)
Bandwidth & Channel spacing	1 MHz & 1 MHz
Method of frequency generation	Synthesizer
Power Supply (inner)	DC 1.2 V / DC 3.3 V
Antenna Type	Monopole Pattern Antenna
Antenna Gain	+0.6dBi

SECTION 3 : Test standard information

3.1 Test Specification

Title : **FCC47CFR 2.1093**
Radiofrequency radiation exposure evaluation: portable devices.

: **IEEE Std 1528-2013:**
IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

: **Published RF exposure KDB procedures**

☑	**KDB447498D01(v06)**	Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies
☐	**KDB447498D02(v02r01)**	SAR Measurement Procedures for USB Dongle Transmitters
☐	**KDB648474D04(v01r03)**	SAR Evaluation Considerations for Wireless Handsets
☐	**KDB941225D01(v03r01)**	3G SAR MEASUREMENT PROCEDURES
☐	**KDB941225D05(v02r05)**	SAR for LTE Devices
☐	**KDB941225D06(v02r01)**	SAR test procedures for devices incorporating SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities (Hot Spot SAR)
☐	**KDB941225D07(v01r02)**	SAR Evaluation Procedures for UMPC Mini-Tablet Devices
☐	**KDB616217D04(v01r02)**	SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers
☑	**KDB865664D01(v01r04)**	SAR Measurement Requirements for 100MHz to 6 GHz
☑	**KDB248227D01(v02r02)**	SAR Measurement Procedures for 802.11(Wi-Fi) Transmitters

Reference
[1]SPEAG uncertainty document (AN 15-7/AN19-17) for DASY 5 System from SPEAG (Schmid & Partner Engineering AG).

3.2 Procedure

Transmitter	**WLAN and Bluetooth**
Test Procedure	Published RF exposure KDB procedures
Category	FCC47CFR 2.1093
Note: UL Japan, Inc. 's SAR Work Procedures 13-EM-W0429 and 13-EM-W0430	

3.3 Exposure limit

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

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.4	8.0	20.0

(B) Limits for General population/Uncontrolled Exposure (W/kg)

Spatial Average (averaged over the whole body	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.08	1.6	4.0

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

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

NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE
SPATIAL PEAK(averaged over any 1g of tissue) LIMIT
1.6 W/kg

3.4 Test Location

*Shielded room for SAR testings
UL Japan, Inc. Ise EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999 Facsimile : +81 596 24 8124

SECTION 4 : Test result

4.1 Stand-alone SAR result

Reported SAR

Measured SAR is scaled to the maximum tune-up tolerance limit by the following formulas.
Reported SAR= Measured SAR [W/kg] · Scaled factor *1
Maximum tune-up tolerance limit is by the specification from a customer.

Body SAR

Mode	Frequency	Measured power (Burst power) [dBm]*2	Measured power (Burst power) [mW]	Maximum tune-up tolerance limit [dBm]*3	Maximum tune-up tolerance limit [mW]*3	Measured SAR [W/kg]	Scaled factor	**Reported SAR [W/kg]**
WLAN11b	2412MHz	9.79	9.53	10.50	11.22	0.076	1.178	**0.089**
Bluetooth	Exemption (Refer to section 6)							

Note
*1 Scaled factor = Maximum tune-up tolerance limit [mW] / Measured power [mW]
*2 The sample used by the SAR test is not more than 2 dB lower than the maximum tune-up tolerance limit. That is, measured power is included the tune-up tolerance range.
*3 The maximum tune-up tolerance limit is defined as maximum timed-average value(considering to maximum duty cycle).

WLAN Maximum tune-up tolerance limit

Mode	**Maximum tune-up tolerance limit [dBm]**	**Maximum tune-up tolerance limit [mW]**
WLAN 11b	10.50	11.22
WLAN 11g	10.50	11.22
WLAN 11n20	10.50	11.22

Bluetooth Maximum tune-up tolerance limit

Mode	**Maximum tune-up tolerance limit [dBm]**	**Maximum tune-up tolerance limit [mW]**
BDR	2.00	1.58
EDR	2.00	1.58
LE	8.50	7.08

***** Maximum tune-up tolerance limit(WLAN and Bluetooth) is defined by a customer as Duty100%.

SECTION 5 SAR test exclusion considerations

5.1 Standalone SAR test exclusion considerations

The following is based on KDB447498D01.

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
f(GHz) is the RF channel transmit frequency in GHz
Power and distance are rounded to the nearest mW and mm before calculation
The result is rounded to one decimal place for comparison
The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

According to KDB 447498D01 § 4.1 f) if the antenna is at close proximity to user then the outer surface of the DUT should be treated as the radiating surface. The test separation distance is then determined by the smallest distance between the outer surface of the device and the user. For the purposes of this report close proximity has been defined as closer than 50 mm. For antennas <50 mm from the rear or edge the separation distance used for the SAR exclusion calculations is 5 mm.

WLAN 2.4GHz

Band	Standalone SAR tested	Positiom	Mode	Upper frequency of band *1	Maximum tune-up tolerance limit *4	Min distance *2	Calculation of exclusion *3
WLAN	☑	Front	11b/g/n	2462 [MHz] (11ch)	10.50 [dBm] 11.22 [mW] 11 [mW]*5	5.00 [mm]	3.5
WLAN	☑	Rear	11b/g/n	2462 [MHz] (11ch)	10.50 [dBm] 11.22 [mW] 11 [mW]*5	5.00 [mm]	3.5
WLAN	☑	Left side	11b/g/n	2462 [MHz] (11ch)	10.50 [dBm] 11.22 [mW] 11 [mW]*5	5.00 [mm]	3.5
WLAN	☑	Right side	11b/g/n	2462 [MHz] (11ch)	10.50 [dBm] 11.22 [mW] 11 [mW]*5	5.00 [mm]	3.5
WLAN	☑	Top side	11b/g/n	2462 [MHz] (11ch)	10.50 [dBm] 11.22 [mW] 11 [mW]*5	5.00 [mm]	3.5
WLAN	☑	Bottom side	11b/g/n	2462 [MHz] (11ch)	10.50 [dBm] 11.22 [mW] 11 [mW]*5	5.00 [mm]	3.5
WLAN	☑	Antenna side	11b/g/n	2462 [MHz] (11ch)	10.50 [dBm] 11.22 [mW] 11 [mW]*5	5.00 [mm]	3.5
WLAN	☑	Antenna side tilt	11b/g/n	2462 [MHz] (11ch)	10.50 [dBm] 11.22 [mW] 11 [mW]*5	5.00 [mm]	3.5

Bluetooth(BDR/EDR)

Band	Standalone SAR tested	Positiom	Mode	Upper frequency of band *1	Maximum tune-up tolerance limit *4	Min distance *2	Calculation of exclusion *3
Bluetooth	□	Front	BDR/EDR	2480 [MHz] (79ch)	2.00 [dBm] 1.58 [mW] 2 [mW]*5	5.00 [mm]	0.6
Bluetooth	□	Rear	BDR/EDR	2480 [MHz] (79ch)	2.00 [dBm] 1.58 [mW] 2 [mW]*5	5.00 [mm]	0.6
Bluetooth	□	Left side	BDR/EDR	2480 [MHz] (79ch)	2.00 [dBm] 1.58 [mW] 2 [mW]*5	5.00 [mm]	0.6
Bluetooth	□	Right side	BDR/EDR	2480 [MHz] (79ch)	2.00 [dBm] 1.58 [mW] 2 [mW]*5	5.00 [mm]	0.6
Bluetooth	□	Top side	BDR/EDR	2480 [MHz] (79ch)	2.00 [dBm] 1.58 [mW] 2 [mW]*5	5.00 [mm]	0.6
Bluetooth	□	Bottom side	BDR/EDR	2480 [MHz] (79ch)	2.00 [dBm] 1.58 [mW] 2 [mW]*5	5.00 [mm]	0.6
Bluetooth	□	Antenna side	BDR/EDR	2480 [MHz] (79ch)	2.00 [dBm] 1.58 [mW] 2 [mW]*5	5.00 [mm]	0.6
Bluetooth	□	Antenna side tilt	BDR/EDR	2480 [MHz] (79ch)	2.00 [dBm] 1.58 [mW] 2 [mW]*5	5.00 [mm]	0.6

Bluetooth(BT LE)

Band	Standalone SAR tested	Positiom	Mode	Upper frequency of band *1	Maximum tune-up tolerance limit *4	Min distance *2	Calculation of exclusion *3
Bluetooth	□	Front	BLE	2480 [MHz] (78ch)	8.50 [dBm] 7.08 [mW] 7 [mW]*5	5.00 [mm]	2.2
Bluetooth	□	Rear	BLE	2480 [MHz] (78ch)	8.50 [dBm] 7.08 [mW] 7 [mW]*5	5.00 [mm]	2.2
Bluetooth	□	Left side	BLE	2480 [MHz] (78ch)	8.50 [dBm] 7.08 [mW] 7 [mW]*5	5.00 [mm]	2.2
Bluetooth	□	Right side	BLE	2480 [MHz] (78ch)	8.50 [dBm] 7.08 [mW] 7 [mW]*5	5.00 [mm]	2.2
Bluetooth	□	Top side	BLE	2480 [MHz] (78ch)	8.50 [dBm] 7.08 [mW] 7 [mW]*5	5.00 [mm]	2.2
Bluetooth	□	Bottom side	BLE	2480 [MHz] (78ch)	8.50 [dBm] 7.08 [mW] 7 [mW]*5	5.00 [mm]	2.2
Bluetooth	□	Antenna side	BLE	2480 [MHz] (78ch)	8.50 [dBm] 7.08 [mW] 7 [mW]*5	5.00 [mm]	2.2
Bluetooth	□	Antenna side tilt	BLE	2480 [MHz] (78ch)	8.50 [dBm] 7.08 [mW] 7 [mW]*5	5.00 [mm]	2.2

*1 The upper frequency of the frequency band was used in order to calculate standalone SAR test exclusion considerations.
*2 When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
Refer to Appendix 4.
*3 [(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] ·[√f(GHz)] ≤ 3.0
If it is Calculation of exclusion ≤ 3.0 standalone SAR test is excluded.
*4 Maximum tune-up tolerance limit is by the specification from a customer.
*5 Maximum tune-up tolerance limit(mW) is rounded to one decimal place.

SECTION 6 : Description of the operating mode

6.1 Output power operating modes

Mode	Frequency Band	Test Frequency	Remarks
WLAN	2412-2462MHz	2412MHz (1 ch) 2437MHz (6 ch) 2462MHz (11 ch)	DSSS(11b)
*The power value of the EUT was set for testing as follows (setting value might be different from product specification value); Power settings: WLAN: 11b/g/n-20: 9dBm BT LE: 5.5dBm Software: WLAN: C597A wireless test firmware Ver.0226 BT LE: C597A wireless test firmware Ver.0226 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.			

6.2 Output power measurement results

Output power measurement for WLAN

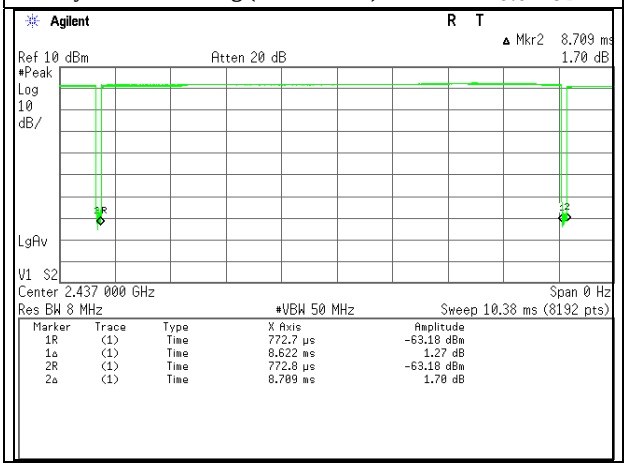
11b **1Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Frame power)		Duty factor	Result (Burst power)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-2.83	2.56	10.02	9.75	9.44	0.04	9.79	9.53
2437	-2.93	2.57	10.02	9.66	9.25	0.04	9.70	9.33
2462	-3.11	2.57	10.02	9.48	8.87	0.04	9.52	8.95

Sample Calculation:
Result (Frame power) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator
Result (Burst power) = Frame power + Duty factor

11b 1Mbps

Tx on / (Tx on + Tx off) = 0.990
Tx on / (Tx on + Tx off) * 100 = 99.0 %
Duty factor = 10 * log (8.709 / 8.622) = 0.04 dB



6.3 SAR testing operating modes

The operating mode for SAR testing was decided by the output power

Mode	Frequency Band	Test Frequency	Note
WLAN	2412-2462MHz	2412MHz (1 ch) *1	DSSS(11b) *2
*The power value of the EUT was set for testing as follows (setting value might be different from product specification value); Power settings: WLAN: 11b/g/n-20: 9dBm Software: WLAN: C597A wireless test firmware Ver.0226 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.			

*1 Highest measured output power channel was tested initially according to KDB248227D01.
The other channel was not required since SAR value of highest measured output power channel was less than 0.8W/kg.

*2 SAR is not required for the following 2.4 GHz OFDM conditions according to KDB248227D01.
When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

6.4 Confirmation after SAR testing

It was checked that the power drift [W] is within +/-5%.The verification of power drift during the SAR test is that DASY5 system calculates the power drift by measuring the e-filed at the same location at beginning and the end of the scan measurement for each test position.

DASY5 system calculation Power drift value[dB] =20log(Ea)/(Eb)
Before SAR testing : Eb[V/m]
After SAR testing : Ea[V/m]

Limit of power drift[W] =+/-5%
X[dB]=10log[P]=10log(1.05/1)=10log(1.05)-10log(1)=0.212dB

from E-filed relations with power.
p=E^2/η=E^2/
Therefore, The correlation of power and the E-filed
XdB=10log(P)=10log(E)^2=20log(E)

Therefore,
The calculated power drift of DASY5 System must be the less than +/-0.212dB.

SECTION 7: Description of the Body setup

7.1 Test position for Body setup

i) Procedure for SAR testing

-The tested procedure was performed according to the KDB 447498 D01 (Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies).

ii) Test mode

WLAN 2.4 GHz	**Data transmission mode (11b)**

iii) Test position

No.	Position	Test distance	WLAN	Bluetooth
			Tested	Tested
1	Front	0mm	☑	☐
2	Rear	0mm	☑	☐
3	Left side	0mm	☑	☐
4	Right side	0mm	☑	☐
5	Top side	0mm	☑	☐
6	Bottom side	0mm	☑	☐
7	Antenna side	0mm	☑	☐
8	Antenna side tilt	0mm	☑	☐

SECTION 8 : Test surrounding

8.1 Measurement uncertainty

This measurement uncertainty budget is suggested by IEEE Std 1528(2013) and IEC62209-2:2010, and determined by Schmid & Partner Engineering AG (DASY5 Uncertainty Budget). Per KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01 Section 2.8.1., when the highest measured SAR(1g) within a frequency band is < 1.5W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std.1528 (2013) is not required in SAR reports submitted for equipment approval.

<0.3 – 3GHz range Body>

Error Description	Uncertai value ±	Probability distribution	divisor	(ci) 1g	Standard (1g)
Measurement System					
Probe calibration	± 6.00	Normal	1	1	± 6.00
Axial isotropy of the probe	± 4.7	Rectangular	√3	0.7	± 1.9
Spherical isotropy of the probe	± 9.6	Rectangular	√3	0.7	± 3.9
Boundary effects	± 1.0	Rectangular	√3	1	± 0.6
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7
Detection limit	± 1.0	Rectangular	√3	1	± 0.6
Modulation response	± 2.4	Rectangular	√3	1	± 1.4
Readout electronics	± 0.3	Normal	1	1	± 0.3
Response time	± 0.8	Rectangular	√3	1	± 0.5
Integration time	± 2.6	Rectangular	√3	1	± 1.5
RF ambient Noise	± 3.0	Rectangular	√3	1	± 1.7
RF ambient Reflections	± 3.0	Rectangular	√3	1	± 1.7
Probe Positioner	± 0.4	Rectangular	√3	1	± 0.2
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7
Max.SAR Eval.	± 2.0	Rectangular	√3	1	± 1.2
Test Sample Related					
Device positioning	± 2.9	Normal	1	1	± 2.9
Device holder uncertainty	± 3.6	Normal	1	1	± 3.6
Power drift	± 5.0	Rectangular	√3	1	± 2.9
Power Scaling	+ 0.0	Rectangular	√3	1	± 0.0
Phantom and Setup					
Phantom uncertainty	± 6.1	Rectangular	√3	1	± 3.5
Algorithm for correcting SAR for deviations in permittivity and conductivity	± 1.9	Normal	1	1	± 1.9
Liquid conductivity (meas.)	+ 1.9	Rectangular	1	0.78	+ 1.5
Liquid permittivity (meas.)	- 1.6	Rectangular	1	0.23	- 0.4
Liquid conductivity - temp.unc (below 2deg.C.)	± 5.2	Rectangular	√3	0.78	± 2.3
Liquid permittivity - temp.unc (below 2deg.C.)	± 0.8	Rectangular	√3	0.23	± 0.1
Combined Standard Uncertainty					± **11.364**
Expanded Uncertainty (k=2)					± **22.7**

*. Table of uncertainties are listed for ISO/IEC 17025.

SECTION 9 : Measurement results

9.1 Body SAR

(1)Method of measurement

Step.1 The searching for the worst position. *1*2*3

Step.2 Change Tx mode of Bluetooth.
The test was performed at the worst condition of Step1.

Note:
*1 Highest measured output power channel was tested initially according to KDB248227D01.
The other channel was not required since SAR value of highest measured output power channel was less than 0.8W/kg.

*2 SAR is not required for the following 2.4 GHz OFDM conditions according to KDB248227D01.
When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg. Refer to (4) OFDM mode exclusion considerations.

*3 Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg in accordance to KDB865664 D1.

(2)Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the DAKS dielectric probe kit.
The dielectric parameters measurement is reported in each correspondent section.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
-	-	-	-	-	2000	εr	53.3	-	-	-	*1
						σ [mho/m]	1.52	-	-	-	
7-Mar	24.0	46	MSL 2450	23.5	2412	εr	52.8	51.9	-1.6	+/-5	*2
						σ [mho/m]	1.91	1.95	1.9	+/-5	
-	-	-	-	-	2450	εr	52.7	-	-	-	*1
						σ [mho/m]	1.95	-	-	-	

εr: Relative Permittivity / σ : Coductivity
*1 The Target value is a parameter defined in KDB 865664D01.
*2 The dielectric parameters should be linearly interpolated between the closest pair of target frequencies to determine the applicable dielectric parameters corresponding to the device test frequency.

(3)Result of Body SAR

BODY SAR MEASUREMENT RESULTS													
Frequency		Modulation	Measured power (Burst power)		Maximum tune-up tolerance limit		Phantom Section	EUT Set-up Conditions			Measured SAR(1g) [W/kg]	Scaled factor *1	Reported SAR(1g) [W/kg] *2
Channel	[MHz]		[dBm]	[mW]	[dBm]	[mW]		Antenna	Position	Separation [mm]			
Step.1 The searching for the worst position													
1	2412	11b 1Mbps	9.79	9.53	10.50	11.22	Flat	Fixed	Front	0	**0.021**	**1.178**	**0.025**
1	2412	11b 1Mbps	9.79	9.53	10.50	11.22	Flat	Fixed	Rear	0	**0.023**	**1.178**	**0.027**
1	2412	11b 1Mbps	9.79	9.53	10.50	11.22	Flat	Fixed	Left side	0	**0.00925**	**1.178**	**0.011**
1	2412	11b 1Mbps	9.79	9.53	10.50	11.22	Flat	Fixed	Right side	0	**0.028**	**1.178**	**0.033**
1	2412	11b 1Mbps	9.79	9.53	10.50	11.22	Flat	Fixed	Top side	0	**0.025**	**1.178**	**0.029**
1	2412	11b 1Mbps	9.79	9.53	10.50	11.22	Flat	Fixed	Bottom side	0	**0.014**	**1.178**	**0.016**
1	2412	11b 1Mbps	9.79	9.53	10.50	11.22	Flat	Fixed	Antenna side	0	**0.029**	**1.178**	**0.034**
1	2412	11b 1Mbps	9.79	9.53	10.50	11.22	Flat	Fixed	Antenna side tilt	0	**0.076**	**1.178**	**0.089**

*1 Scaled factor = Maximum tune-up tolerance limit [mW] / Measured power [mW]
*2 Reported SAR= Measured SAR [W/kg] · Scaled factor

OFDM mode exclusion considerations

OFDM was excluded from the following table according to KDB248227D01.

Maximum tune-up tolerance limit		Maximum tune-up tolerance limit		OFDM scaled factor *3	Estimated SAR of OFDM Reported SAR(1g) [W/kg] *4	Exclusion limit [W/kg]	**Standalone SAR tested**
DSSS		OFDM(11g/n20)					
[dBm]	[mW]	[dBm]	[mW]				
10.50	11.22	10.50	11.22	1.000	**0.089**	< 1.2	☐

*3 OFDM scaled factor = Maximum tune-up tolerance limit of OFDM [mW] / Maximum tune-up tolerance limit of DSSS [mW]
*4 Estimated SAR of OFDM= Reported SAR of DSSS[W/kg] · OFDM scaled factor

SECTION 10 Test instruments

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MCC-137	Microwave cable	HUBER+SUHNER	SUCOFLEX 102	37954/2	AT	2015/10/08 * 12
MAT-22	Attenuator(10dB) 1-18GHz	Orient Microwave	BX10-0476-00	-	AT	2015/03/18 * 12
MPM-08	Power Meter	Anritsu	ML2495A	6K00003338	AT	2015/10/08 * 12
MSA-14	Spectrum Analyzer	Agilent	E4440A	MY48250080	AT	2015/10/07 * 12
MPSE-11	Power sensor	Anritsu	MA2411B	011737	AT	2015/10/08 * 12
MAT-10	Attenuator(10dB)	Weinschel Corp	2	BL1173	AT	2015/11/10 * 12
MCC-38	Coaxial Cable	UL Japan	-	-	AT	2015/12/07 * 12
MNA-03	Vector Reflectometer	Copper Mountain Technologies	PLANAR R140	0030913	SAR	2015/10/30 * 12
MDPK-03	Dielectric assessment kit	Schmid&Partner Engineering AG	DAK-3.5	0008	SAR	2015/03/10 * 12
MOS-37	Digital thermometer	LKM electronic	DTM3000	-	SAR	2015/07/07 * 12
COTS-MSAR-04	Dielectric assessment software	Schmid&Partner Engineering AG	DAK		SAR	-
MDAE-01	Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE4	509	SAR	2015/07/07 * 12
MPB-07	Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV4	3825	SAR	2015/12/11 * 12
MPF-02	2mm Oval Flat Phantom	Schmid&Partner Engineering AG	QDOVA001BB	1045	SAR	2015/05/11 * 12
MDH-01	Device holder	Schmid&Partner Engineering AG	Mounting device for transmitter	-	SAR	Pre Check
MOS-26	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q29	SAR	2015/04/28 * 12
COTS-MSAR-03	Dasy5	Schmid&Partner Engineering AG	DASY5	-	SAR	-
MRBT-02	SAR robot	Schmid&Partner Engineering AG	TX60 Lspeag	F10/5E3LA1/A/01	SAR	2015/05/29 * 12
MPM-11	Dual Power Meter	Agilent	E4419B	MY45102060	SAR	2015/08/04 * 12
MPSE-15	Power sensor	Agilent	E9301A	MY41498311	SAR	2015/08/04 * 12
MPSE-16	Power sensor	Agilent	E9301A	MY41498313	SAR	2015/08/04 * 12
MRFA-24	Pre Amplifier	R&K	R&K CGA020M602-2633R	B30550	SAR	2015/06/15 * 12
MSG-10	Signal Generator	Agilent	N5181A	MY47421098	SAR	2015/11/16 * 12
MAT-78	Attenuator	Telegrartner	J01156A0011	0042294119	SAR	Pre Check
MPM-15	Power Meter	Agilent	N1914A	MY53060017	SAR	2015/06/15 * 12
MPSE-21	Power sensor	Agilent	N8482H	MY52460010	SAR	2015/06/15 * 12
MHDC-12	Dual Directional Coupler	Hewlett Packard	772D	2839A0016	SAR(2-18GHz)	Pre Check
MDA-07	Dipole Antenna	Schmid&Partner Engineering AG	D2450V2	713	SAR(D2450)	2013/09/10 * 36
MMSL2450	Tissue simulation liquid (Body)	Schmid&Partner Engineering AG	MSL2450V2	SL AA 245 BA	SAR*Daily Check Target Value ±5%	Pre Check

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

APPENDIX 1 : SAR Measurement data

1. Evaluation procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the E-field at a fixed location above the ear point or central position of flat phantom was used as a reference value for assessing the power drop.

Step 2: The SAR distribution at the exposed side of head or body position was measured at a distance of each device from the inner surface of the shell. The area covered the entire dimension of the antenna of EUT and the horizontal grid spacing was 15 mm x 15 mm, 12 mm x 12 mm or 10mm x 10mm. Based on these data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Around this point found in the Step 2 (area scan), a volume of 30mm x 30mm x 30mm or more was assessed by measuring 7 x 7 x 7 points at least for below 3GHz and a volume of 28 mm x 28mm x 22.5mm or more was assessed by measuring 8 x 8 x 6(ratio step method (*1)) points at least for 5GHz band.

And for any secondary peaks found in the Step2 which are within 2dB of maximum peak and not with this Step3 (Zoom scan) is repeated. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

(1). The data at the surface were extrapolated, since the center of the dipoles is 1mm(EX3DV4) away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm [4]. A polynomial of the fourth order was calculated through the points in z-axes.
This polynomial was then used to evaluate the points between the surface and the probe tip.

(2). The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot"-condition (in x, y and z-directions) [4], [5]. The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

(3). All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the E-field at the same location as in Step 1.

***1. Ratio step method parameters used;**
The first measurement point: 2mm from the phantom surface, the initial grid separation: 2mm, subsequent graded grid ratio: 1.5
These parameters comply with the requirement of the KDB 865664D01.

2. Measurement data

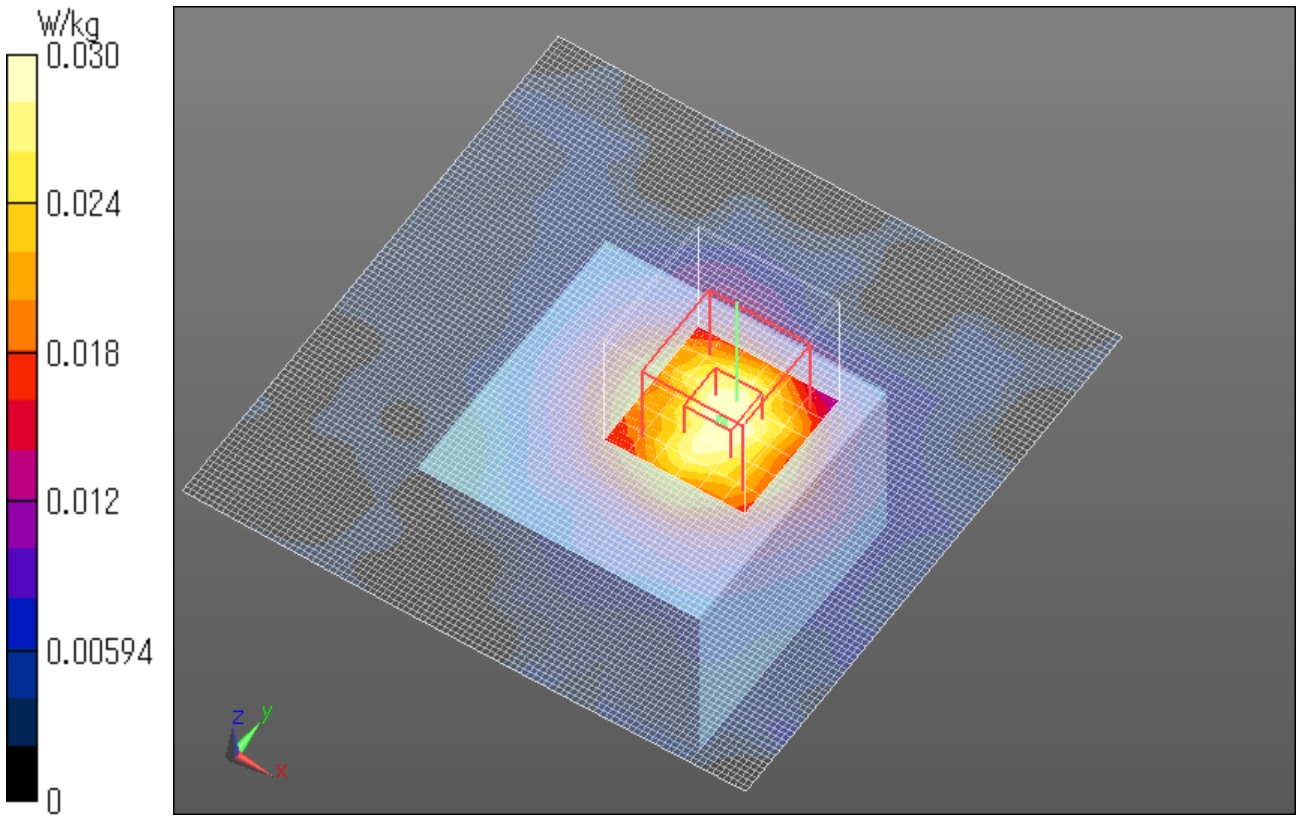
WLAN 11b 1Mbps 2412MHz Front
Communication System: UID 0, WLAN 11a/b/g/n (0); Communication System Band: 11b/g/n (2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.951 S/m; ε_r = 51.919; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/12/11;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2015/07/07
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1045
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Front procedure/Area Scan (101x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.0297 W/kg

Configuration/Front procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.247 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.0400 W/kg
SAR(1 g) = 0.021 W/kg; SAR(10 g) = 0.011 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0301 W/kg
Date: 2016/03/07
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.

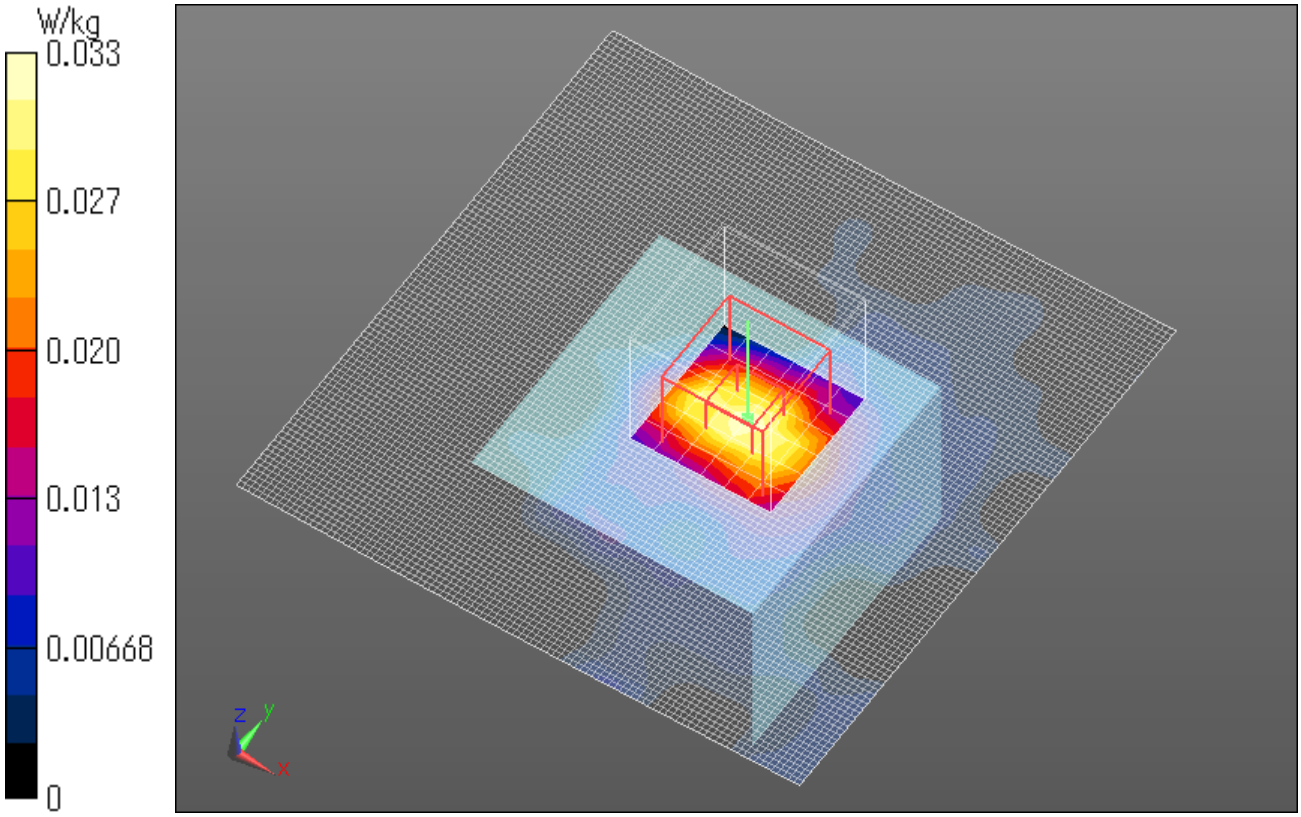


WLAN 11b 1Mbps 2412MHz Rear
Communication System: UID 0, WLAN 11a/b/g/n (0); Communication System Band: 11b/g/n (2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.951 S/m; ε_r = 51.919; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/12/11;
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2015/07/07
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1045
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Rear procedure/Area Scan (101x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.0366 W/kg

Configuration/Rear procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.966 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 0.0430 W/kg
SAR(1 g) = 0.023 W/kg; SAR(10 g) = 0.010 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0334 W/kg
Date: 2016/03/07
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.

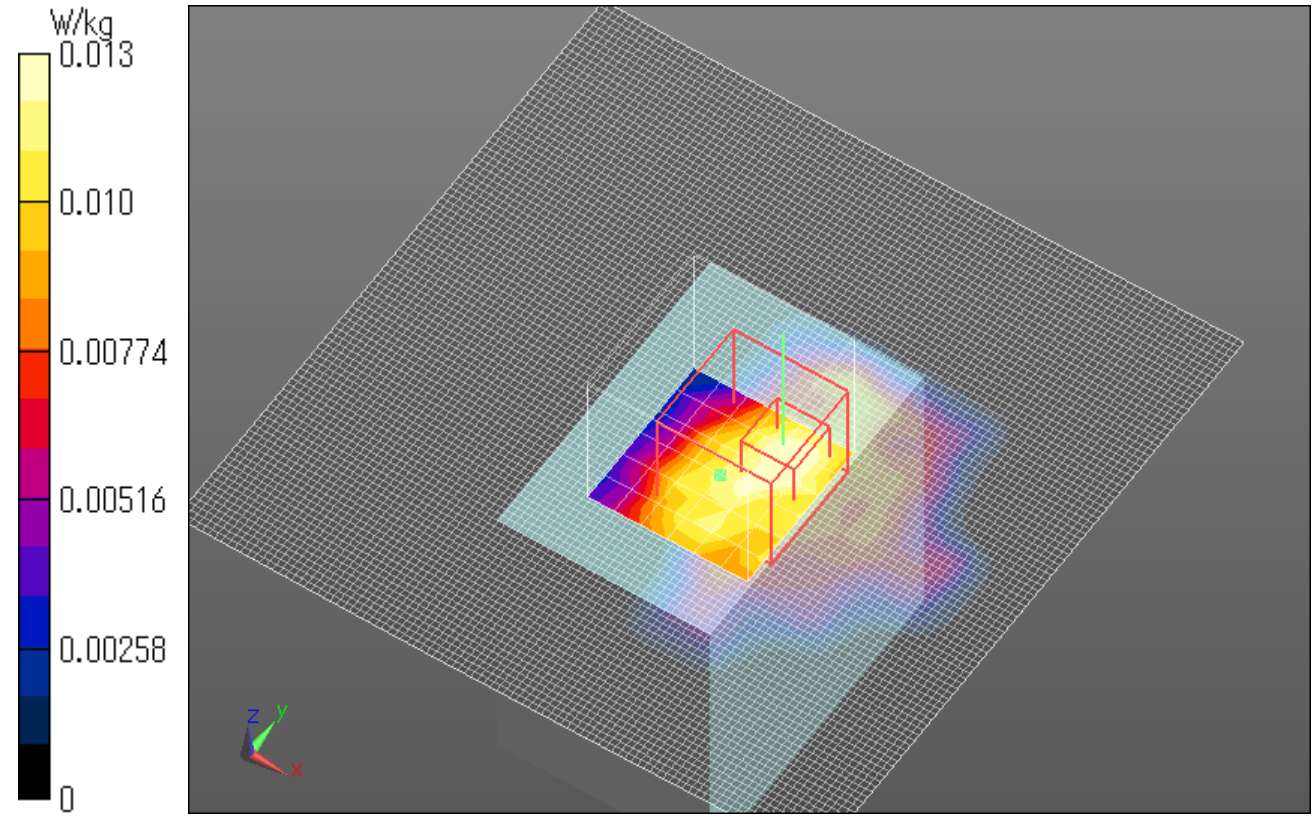


WLAN 11b 1Mbps 2412MHz Left side
Communication System: UID 0, WLAN 11a/b/g/n (0); Communication System Band: 11b/g/n (2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.951 S/m; ε_r = 51.919; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/12/11;
Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2015/07/07
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1045
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Left side procedure/Area Scan (101x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.0136 W/kg

Configuration/Left side procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.220 V/m; Power Drift = -0.20 dB
Peak SAR (extrapolated) = 0.0160 W/kg
SAR(1 g) = 0.00925 W/kg; SAR(10 g) = 0.00467 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0129 W/kg
Date: 2016/03/07
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.

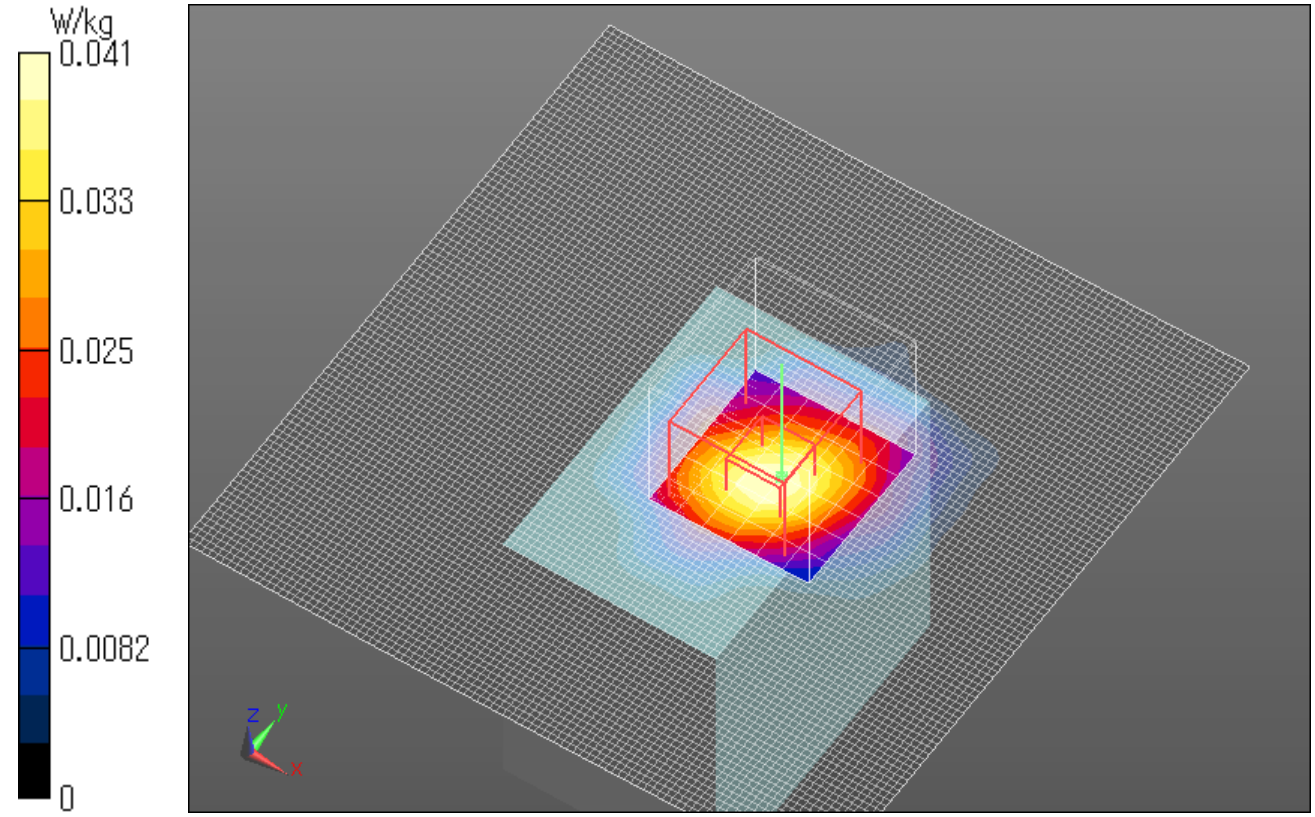


WLAN 11b 1Mbps 2412MHz Right side
Communication System: UID 0, WLAN 11a/b/g/n (0); Communication System Band: 11b/g/n (2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.951 S/m; ε_r = 51.919; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/12/11;
Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2015/07/07
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1045
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Right side procedure/Area Scan (101x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.0369 W/kg
Configuration/Right side procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.038 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.0580 W/kg
SAR(1 g) = 0.028 W/kg; SAR(10 g) = 0.013 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0410 W/kg
Date: 2016/03/07
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.

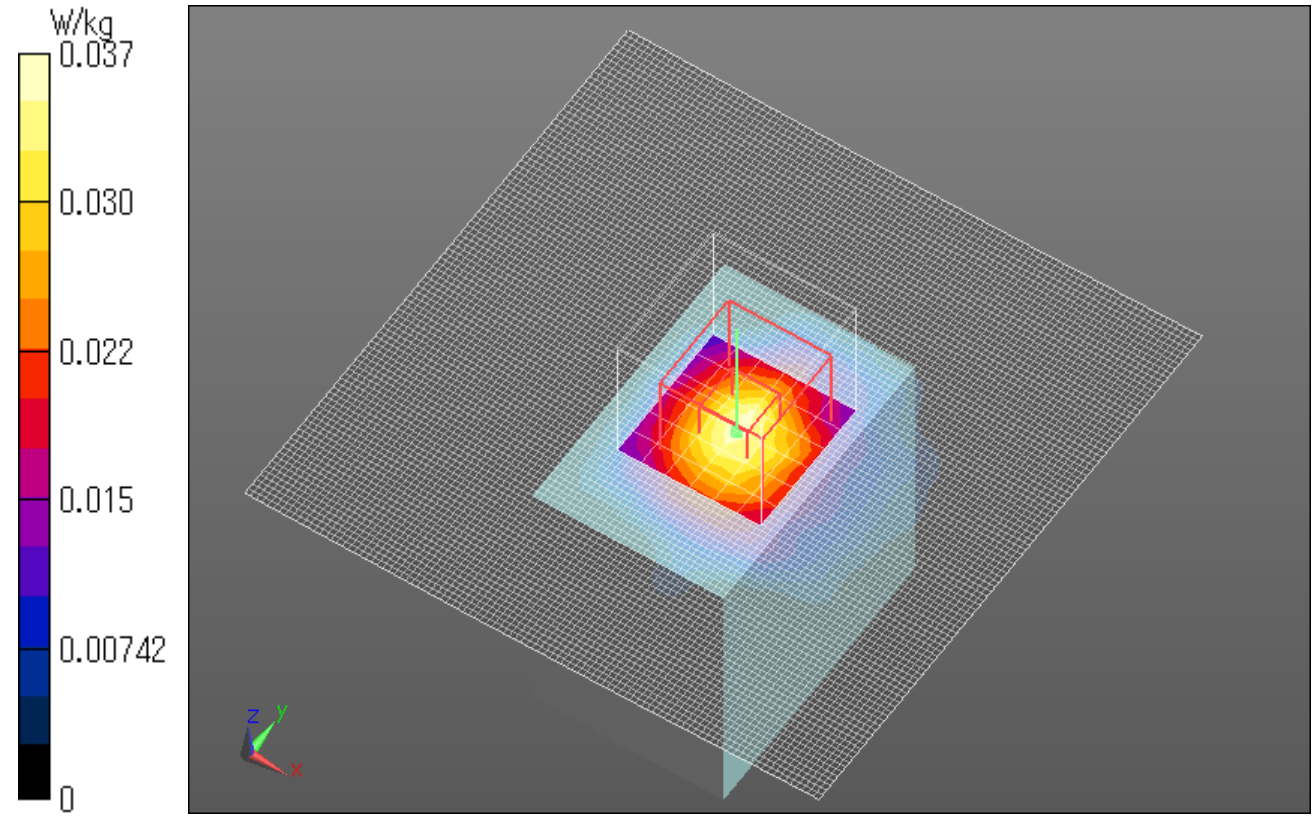


WLAN 11b 1Mbps 2412MHz Top side
Communication System: UID 0, WLAN 11a/b/g/n (0); Communication System Band: 11b/g/n (2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.951 S/m; ε_r = 51.919; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/12/11;
Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2015/07/07
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1045
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Top side procedure/Area Scan (101x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.0341 W/kg

Configuration/Top side procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.205 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 0.0490 W/kg
SAR(1 g) = 0.025 W/kg; SAR(10 g) = 0.011 W/kg
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0371 W/kg
Date: 2016/03/07
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.

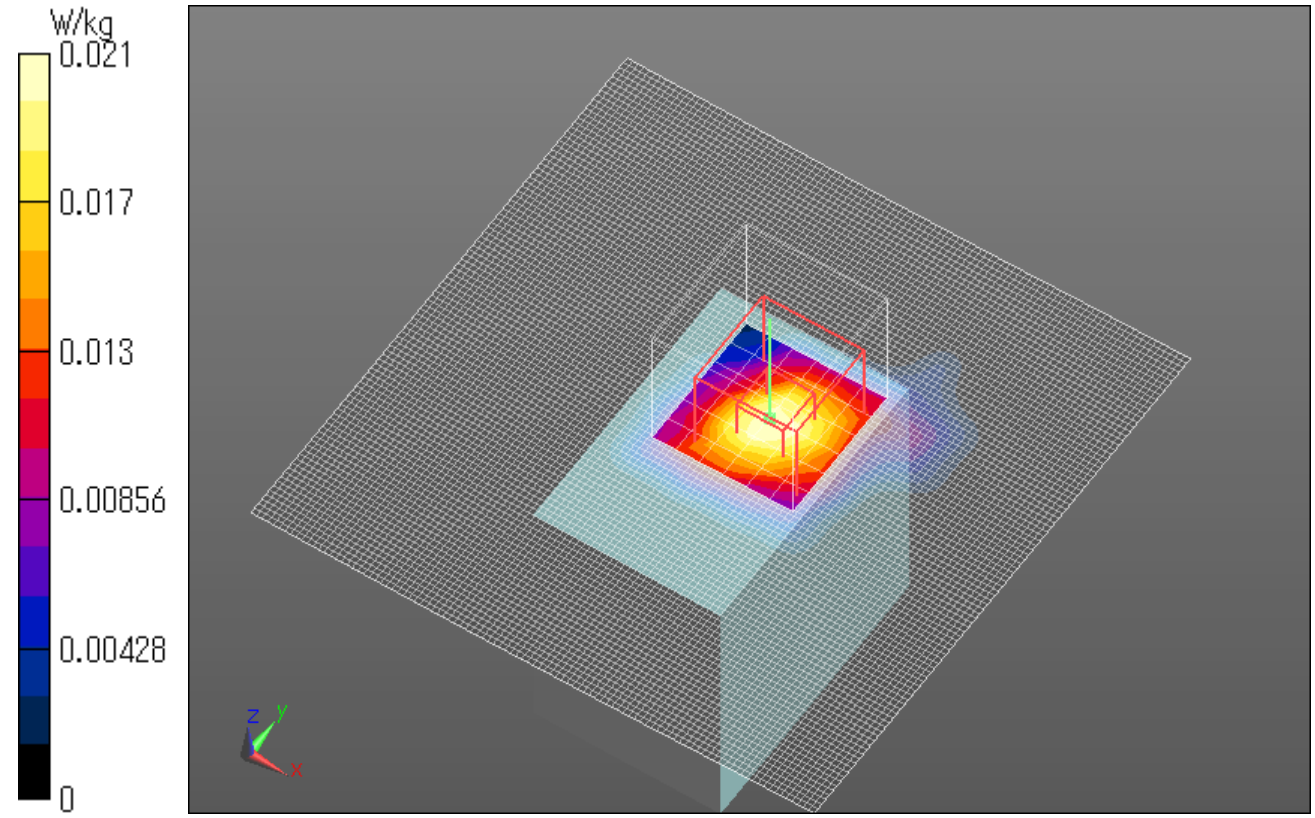


WLAN 11b 1Mbps 2412MHz Bottom side
Communication System: UID 0, WLAN 11a/b/g/n (0); Communication System Band: 11b/g/n (2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.951 S/m; ε_r = 51.919; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/12/11;
Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2015/07/07
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1045
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)
Configuration/Bottom side procedure/Area Scan (101x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.0228 W/kg

Configuration/Bottom side procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.755 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.0300 W/kg
SAR(1 g) = 0.014 W/kg; SAR(10 g) = 0.00619 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0214 W/kg

Date: 2016/03/07
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



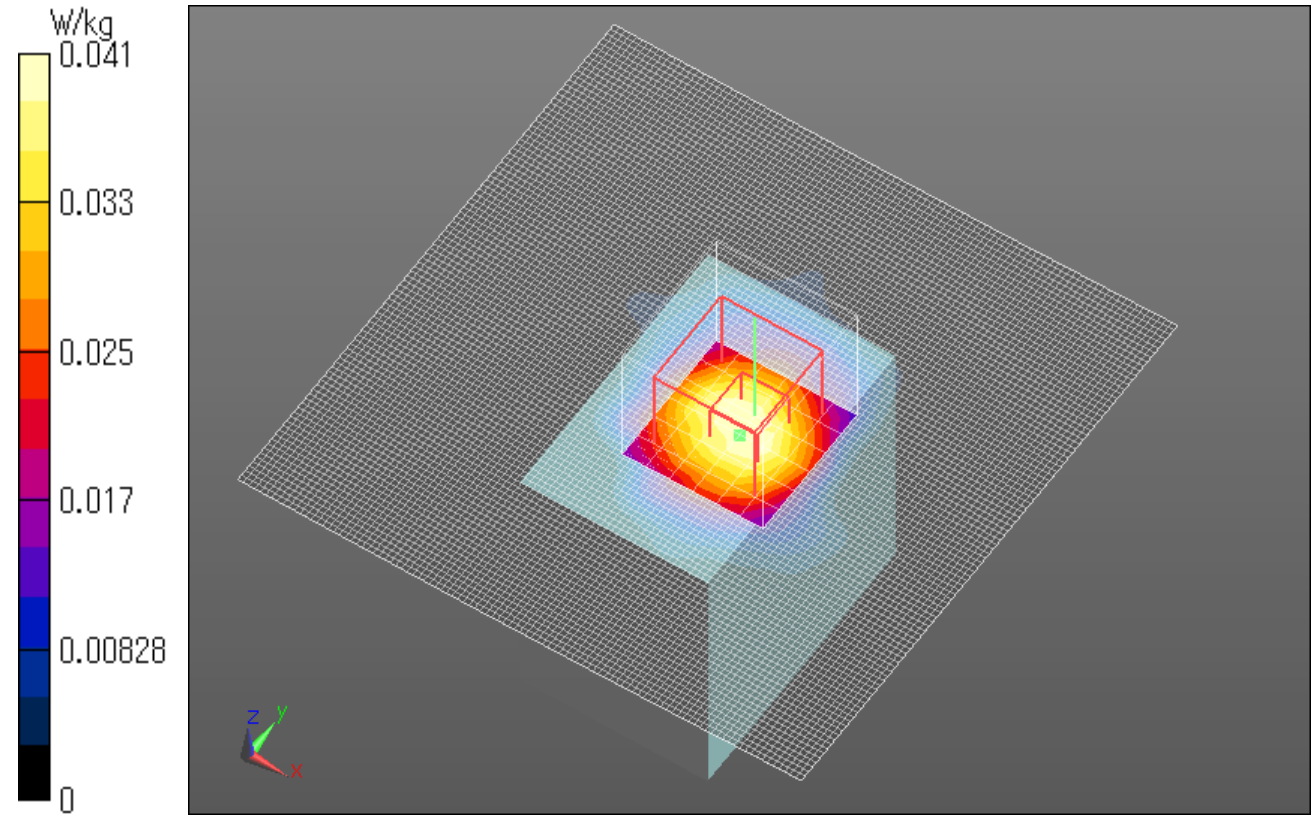
WLAN 11b 1Mbps 2412MHz Antenna side
Communication System: UID 0, WLAN 11a/b/g/n (0); Communication System Band: 11b/g/n (2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.951 S/m; ε_r = 51.919; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/12/11;
Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2015/07/07
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1045
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Antenna side procedure/Area Scan (101x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.0461 W/kg

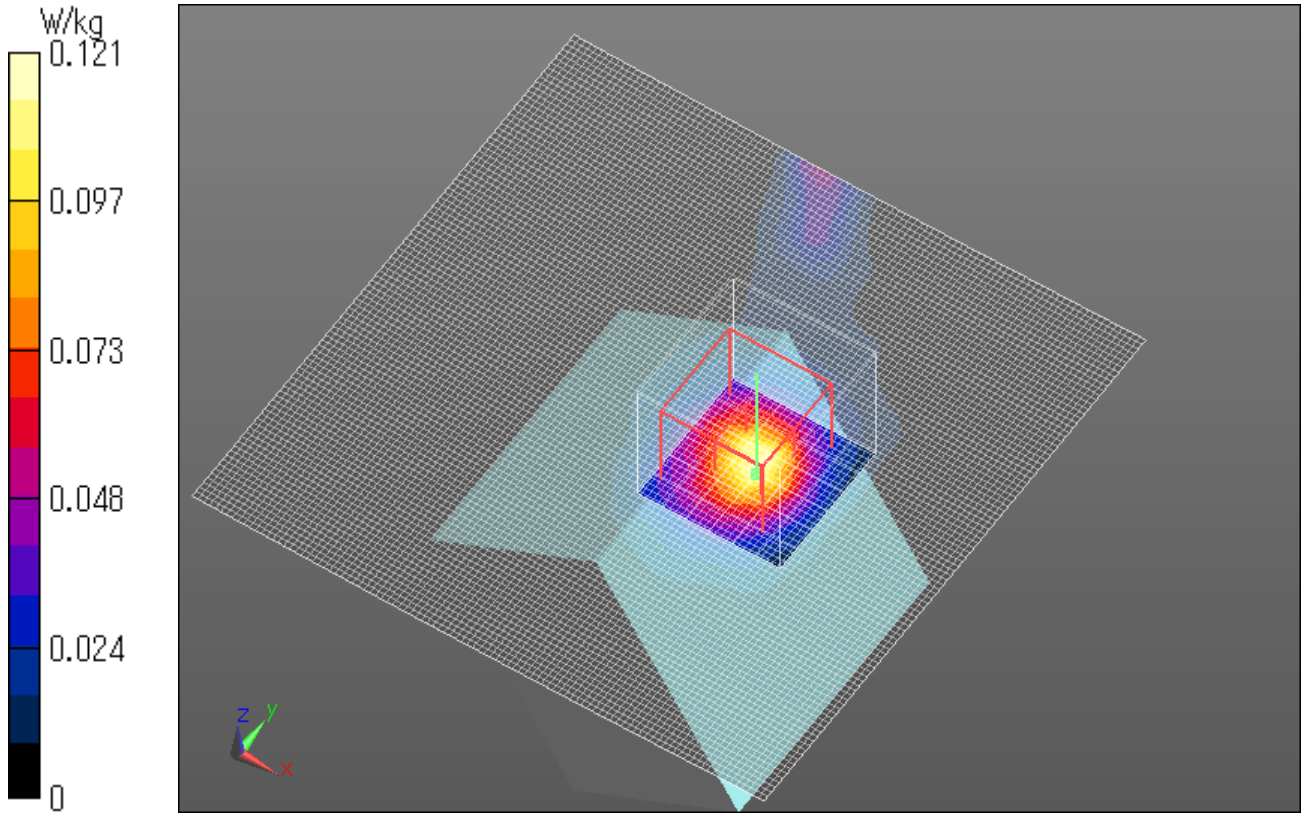
Configuration/Antenna side procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.553 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 0.0560 W/kg
SAR(1 g) = 0.029 W/kg; SAR(10 g) = 0.014 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0414 W/kg
Date: 2016/03/07
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



WLAN 11b 1Mbps 2412MHz Antenna side tilt
Communication System: UID 0, WLAN 11a/b/g/n (0); Communication System Band: 11b/g/n (2.4G); Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.951 S/m; ε_r = 51.919; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/12/11;
Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2015/07/07
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1045
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/Antenna side tilt procedure a/Area Scan (101x101x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.110 W/kg
Configuration/Antenna side tilt procedure a/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.068 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 0.173 W/kg
SAR(1 g) = 0.076 W/kg; SAR(10 g) = 0.031 W/kg
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.121 W/kg
Date: 2016/03/07
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



APPENDIX2 : System Check

1. System check result Body 2450MHz

(1) Simulated Tissue Liquid Parameter confirmation

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
7-Mar	24.0	46	MSL 2450	23.5	2450	εr	52.7	51.8	-1.7	+/-5	*1
						σ [mho/m]	1.95	2.01	2.9	+/-5	

εr: Relative Permittivity / σ : Coductivity
*1 The Target value is a parameter defined in KDB 865664D01.

DIELECTRIC PARAMETERS MEASUREMENT RESULTS											
Date	Ambient Temp. [deg.c]	Relative Humidity [%]	Liquid type	Liquid Temp. [deg.c]	Measured Frequency [MHz]	Parameters	Target Value	Measured	Deviation [%]	Limit [%]	Remark
7-Mar	24.0	46	MSL 2450	23.5	2450	εr	52.2	51.8	-0.8	+/-6	*2 *3
						σ [mho/m]	2.00	2.01	0.3	+/-6	

εr: Relative Permittivity / σ : Coductivity
*2 The target value is the calibrated dipole Body TSL parameters. (D2450V2 SN:713, Measured Body TSL parameters)
*3 The limit is for deviation provided by manufacture.

(2) System check result (for calibration by manufacture)

SYSTEM CHECK							
Date	Frequency [MHz]	SAR 1g [W/kg]		Target Value(1W)	Deviation [%]	Limit [%]	Remark
		Forward Power Measured	Conversion 1W Calculation				
7-Mar	2450.00	13.30	53.20	50.40	5.6	+/-10	*4

*4 The taget value is the parameter defined in SAR measured x4(12.6 x 4 = 50.4) in manufacturer calibrated dipole (D2450V2 SN:713)
Please refer to " SAR result with Body TSL of Appendix 2 2. System Check Dipole (D2450V2 SN:713)".

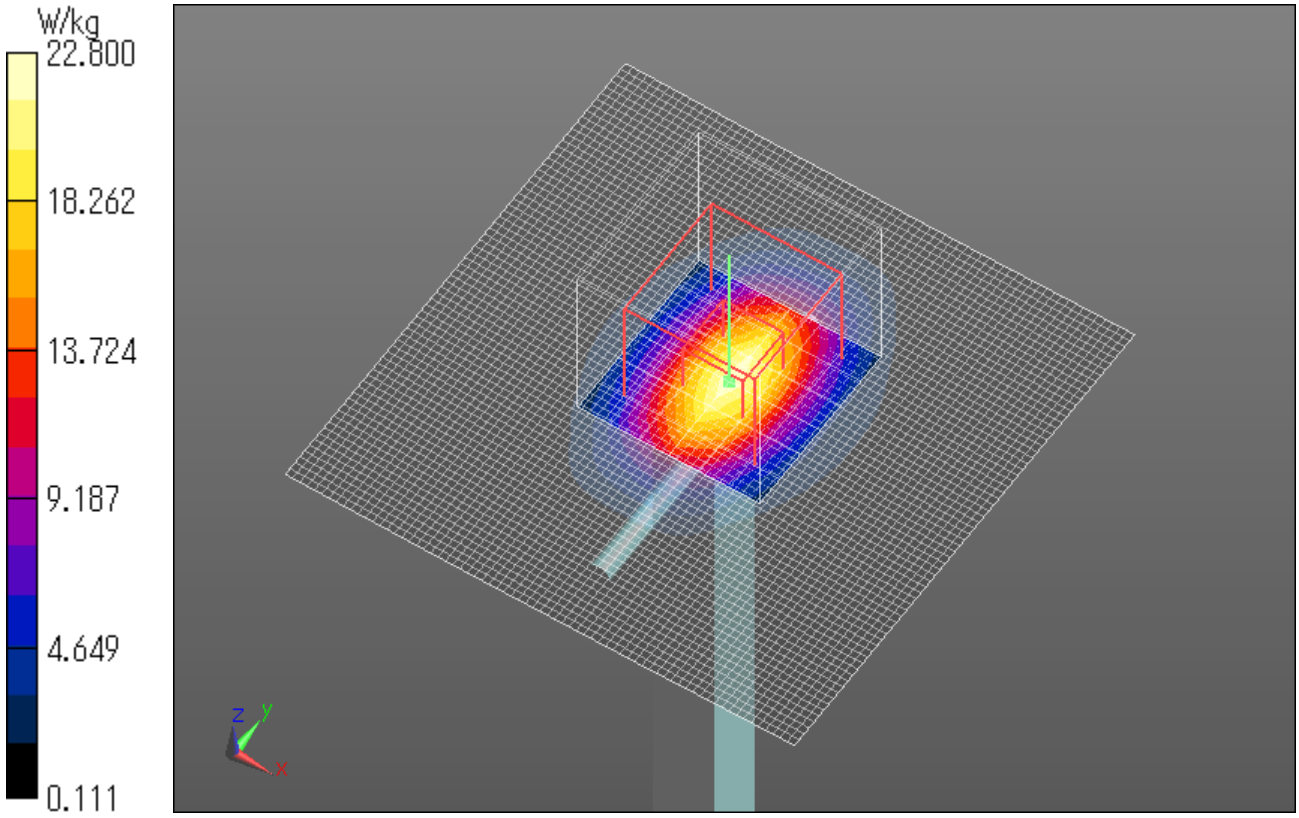
BODY 2450MHz System Check DATA / Dipole 2450MHz / Forward Conducted Power : 250mW

20160307_SAR3_SystemPerformanceCheck-D2450
Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.006 S/m; ε_r = 51.79; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/12/11;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn509; Calibrated: 2015/07/07
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1045
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/CW/Area Scan (71x71x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 22.4 W/kg

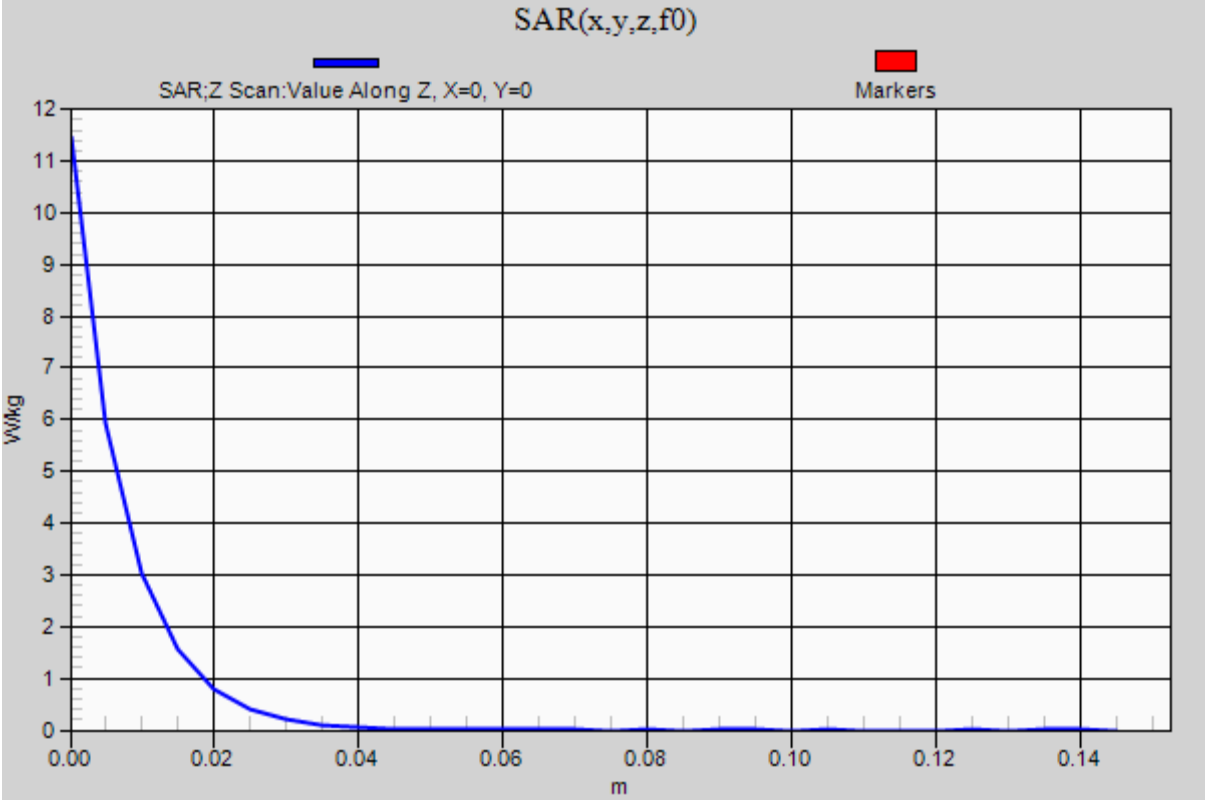
System Performance Check at Frequencies above 1 GHz/CW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.0 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 28.5 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.03 W/kg
Maximum value of SAR (measured) = 22.8 W/kg
Date: 2016/03/07
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



20160307_SAR3_SystemPerformanceCheck-D2450
Communication System: UID 0, CW (0); Communication System Band: D2450 (2450.0 MHz); Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.006 S/m; ε_r = 51.79; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY5 Configuration
Probe: EX3DV4 - SN3825; ConvF(7.29, 7.29, 7.29); Calibrated: 2015/12/11;
Sensor-Surface: 0mm (Fix Surface)
Electronics: DAE4 Sn509; Calibrated: 2015/07/07
Phantom: ELI v4.0 (20deg probe tilt); Type: QDOVA001BB; Serial: TP:1045
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

System Performance Check at Frequencies above 1 GHz/CW/Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Maximum value of SAR (measured) = 11.5 W/kg
Date: 2016/03/07
Ambient Temp. : 24.0 degree.C. Liquid Temp.; 23.5 degree.C.



2. System Check Dipole (D2450V2,S/N:713) SAR Calibration Certificate - Dipole 2450MHz

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

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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 UL Japan (PTT)

Certificate No: D2450V2-713_Sep13

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 713
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 10, 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 (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

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: September 10, 2013

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

Certificate No: D2450V2-713_Sep13 Page 1 of 8

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) KDB 865664, "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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
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	39.4 ± 6 %	1.83 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 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	52.2 ± 6 %	2.00 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.6 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**49.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.89 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.4 W/kg ± 16.5 % (k=2)**

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 Ω + 0.7 jΩ
Return Loss	- 34.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.7 Ω + 2.8 jΩ
Return Loss	- 30.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.162 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	July 05, 2002

DASY5 Validation Report for Head TSL

Date: 10.09.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 713

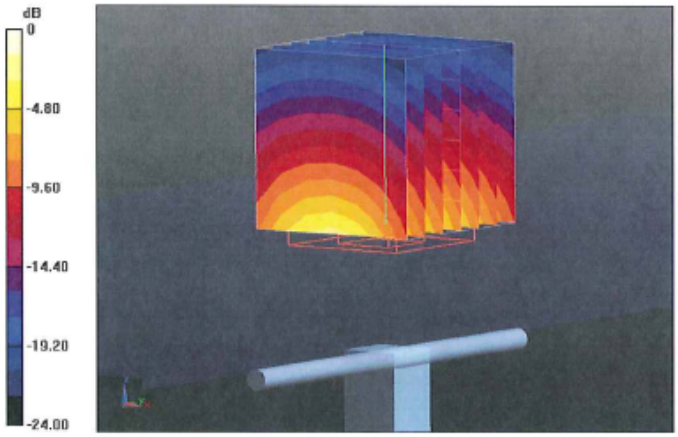
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.83 S/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

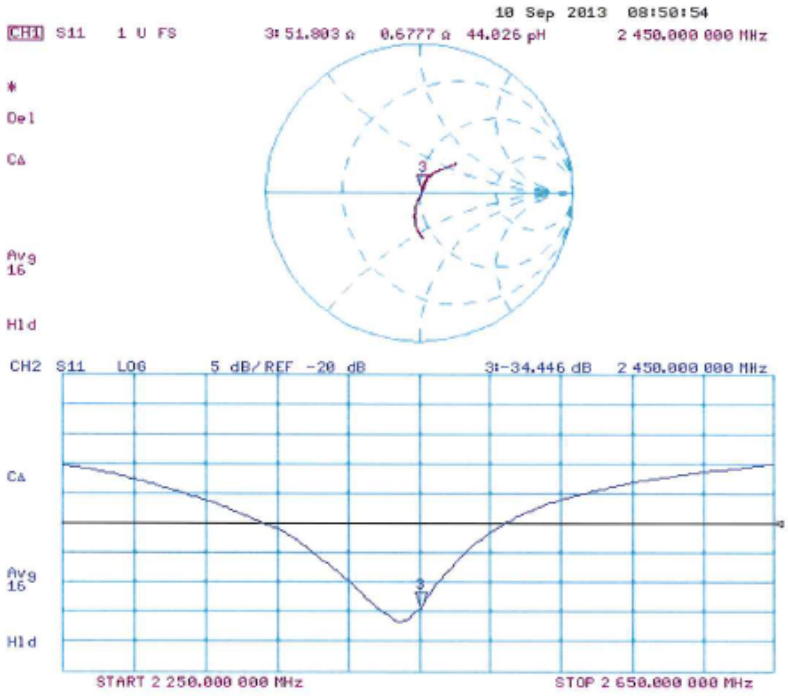
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.095 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 26.7 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 6.05 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: 10.09.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 713

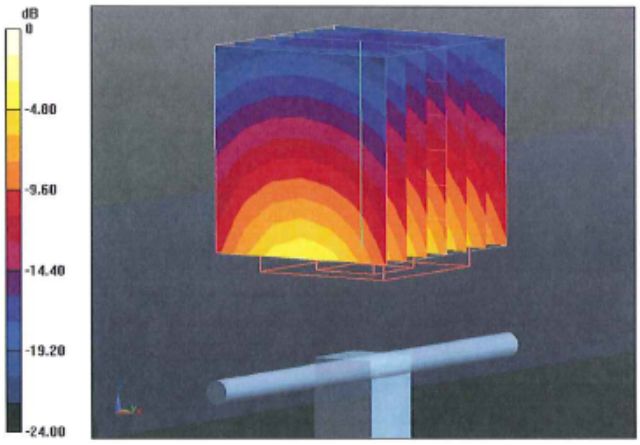
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2 S/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.095 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 26.1 W/kg
SAR(1 g) = 12.6 W/kg; SAR(10 g) = 5.89 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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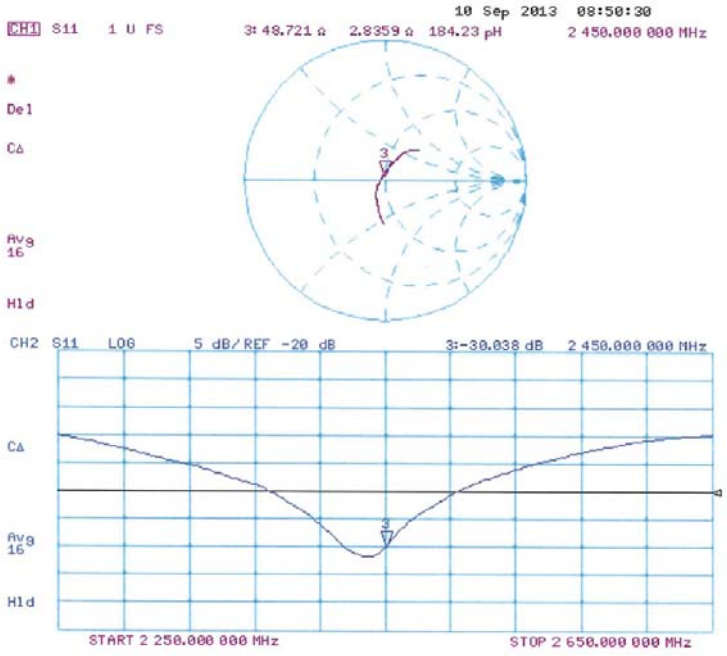
Impedance Measurement Plot for Body TSL



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D2450V2 Calibration for Impedance and Return-loss

Equipment	Dipole Antenna	Model	D2450V2
Manufacture	Schmid&Partner Engineering AG	Serial	713
Tested by	Tomohisa Nakagawa		

1. Test environment

Date	July 21, 2015		
Ambient Temperature	24.0 deg.C	Relative humidity	50%RH

2. Equipment used

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
EST-54	Network Analyzer	Hewlett Packard	8753ES	US39171615	SAR	2015/05/05 * 12
EST-08	Calibration Kit	Agilent	85032B	3217A12903	SAR	2015/05/04 * 12
MPF-04	2mm Oval Flat Phantom	Schmid&Partner Engineering AG	QDOVA001BB	1207	SAR	2015/05/11 * 12
MPSAM-04	SAM Phantom	Schmid&Partner Engineering AG	QD000P40CD	1762	SAR	2015/05/11 * 12
MOS-38	Digital thermometer	HANNA	Checktemp 4	-	SAR	2015/04/28 * 12
MOS-31	Thermo-Hygrometer	Custom	CTH-201	3101	SAR	2015/07/07 * 12
HSL2450						Daily check
MSL2450						Daily check
SAR room1						Daily check

3. Test Result

Impeadance,Transformed to feed point	Head	Deviation	Tolerance	Result
Calibration (SPEAG) 2013/09/10	51.8 Ω+0.7jΩ	-	-	-
Calibration(ULJ)2015/7/21	50.94Ω+0.86jΩ	-0.9Ω+0.2jΩ	+/-5Ω+/-5jΩ	Complied

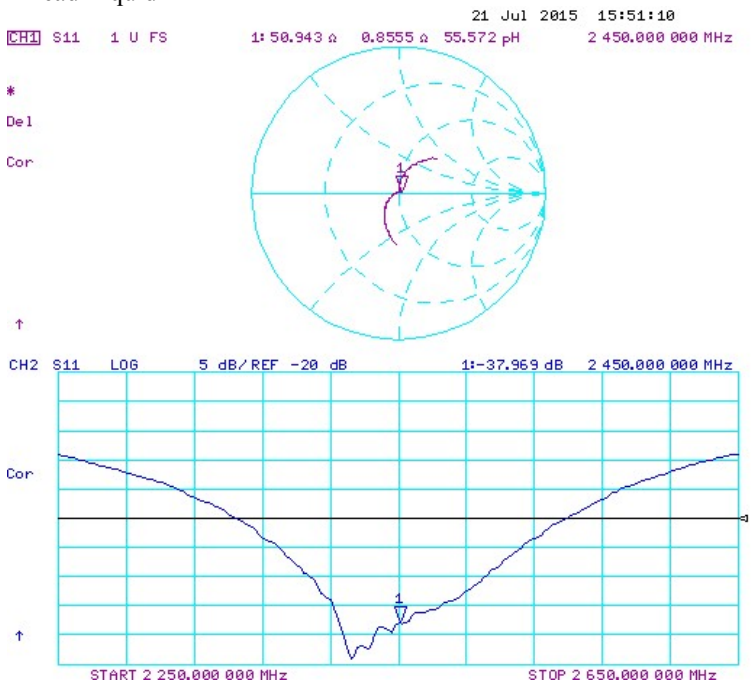
Return loss	Head	Deviation	Tolerance	Result
Calibration (SPEAG) 2013/09/10	-34.4dB	-	-	-
Calibration(ULJ)2015/7/21	-37.97dB	-3.5dB	-34.4 *+/-20%	Complied
Impeadance,Transformed to feed point	Body	Deviation	Tolerance	Result
Calibration (SPEAG) 2013/09/10	48.7Ω+2.8jΩ	-	-	-
Calibration(ULJ)2015/7/21	50.53Ω+2.48jΩ	+1.8Ω+/-0.3jΩ	+/-5Ω+/-5jΩ	Complied

Return loss	Body	Deviation	Tolerance	Result
Calibration (SPEAG) 2013/09/10	-30.0dB	-	-	-
Calibration(ULJ)2015/7/21	-31.95dB	-1.95dB	-30.0 *+/-20%	Complied

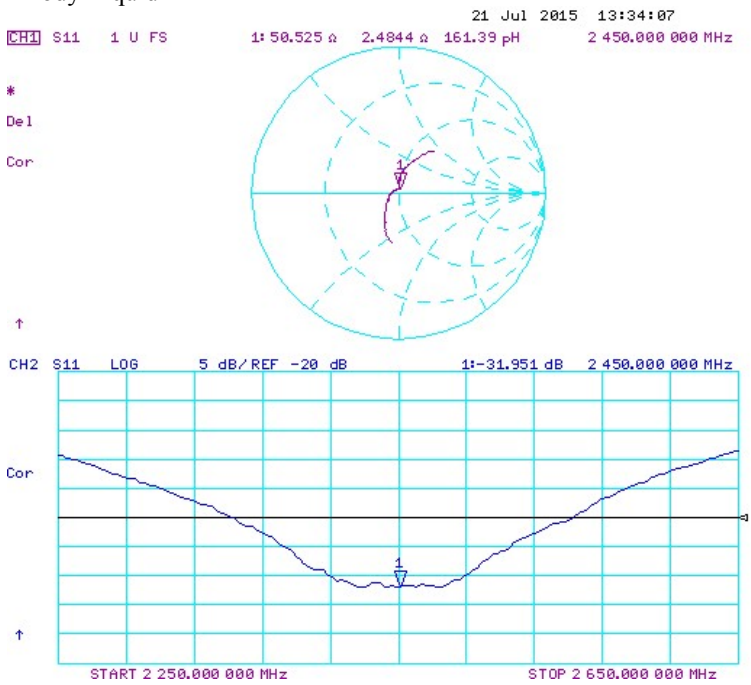
*Tolerance : According to the KDB450824D02

Measurement Plots

<Head Liquid>



<Body Liquid>



3. System check uncertainty

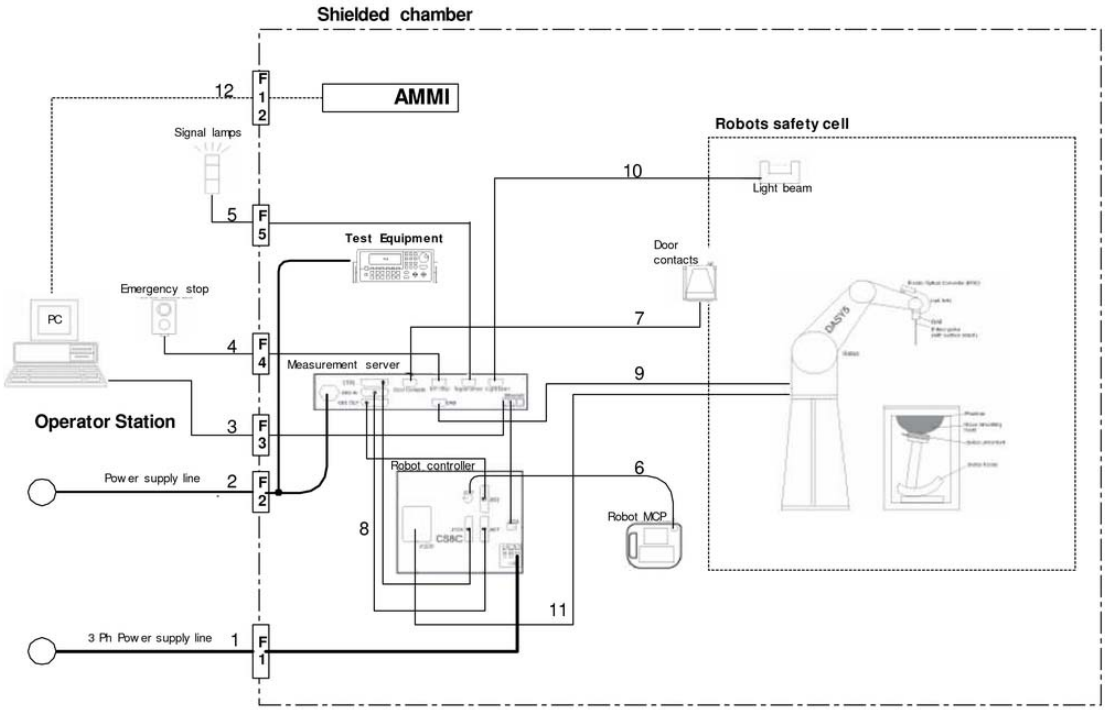
The uncertainty budget has been determined for the DASY5 measurement system according to the SPEAG documents and is given in the following Table.

Repeatability Budget for System Check
<0.3 – 3GHz range Body>

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard (1g)	vi or veff
Measurement System						
Probe calibration	± 1.8	Normal	1	1	± 1.8	∞
Axial isotropy of the probe	± 0.0	Rectangular	√3	1	± 0.0	∞
Spherical isotropy of the probe	± 0.0	Rectangular	√3	0	± 0.0	∞
Boundary effects	± 0.0	Rectangular	√3	1	± 0.0	∞
Probe linearity	± 0.0	Rectangular	√3	1	± 0.0	∞
Detection limit	± 0.0	Rectangular	√3	1	± 0.0	∞
Modulation response	± 0.0	Rectangular	√3	1	± 0.0	∞
Readout electronics	± 0.0	Normal	1	1	± 0.0	∞
Response time	± 0.0	Rectangular	√3	1	± 0.0	∞
Integration time	± 0.0	Rectangular	√3	1	± 0.0	∞
RF ambient Noise	± 0.0	Rectangular	√3	1	± 0.0	∞
RF ambient Reflections	± 0.0	Rectangular	√3	1	± 0.0	∞
Probe Positioner	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Max.SAR Eval.	± 0.0	Rectangular	√3	1	± 0.0	∞
Test Sample Related						
Deviation of wxp.dipole	± 0.0	Normal	√3	1	± 0.0	∞
Dipole Axis to Liquid Distance	± 2.0	Normal	√3	1	± 1.2	∞
Input power and SAR drift meas.	± 3.4	Rectangular	√3	1	± 2.0	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Algorithm for correcting SAR for deviations in permittivity and conductivity	± 1.9	Normal	1	1	± 1.9	∞
Liquid conductivity (meas.)	± 5.0	Rectangular	1	0.78	+ 3.9	∞
Liquid permittivity (meas.)	± 5.0	Rectangular	1	0.26	- 1.3	∞
Liquid conductivity - temp.unc (below 2deg.C.)	± 1.7	Rectangular	√3	0.78	± 0.8	∞
Liquid permittivity - temp.unc (below 2deg.C.)	± 0.3	Rectangular	√3	0.23	± 0.0	∞
Combined Standard Uncertainty					± **6.144**	
Expanded Uncertainty (k=2)					± **12.3**	

APPENDIX 3 : System specifications

1. Configuration and peripherals



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

a) A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
An arm extension for accommodating the data acquisition electronics (DAE).

b) An isotropic field probe optimized and calibrated for the targeted measurement.

c) 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.

d) The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection.
The EOC is connected to the measurement server.

e) The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.

f) The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.

g) A computer running WinXP and the DASY5 software.

h) Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

i) The phantom, the device holder and other accessories according to the targeted measurement.

2. Specifications

a)Robot TX60L

Number of Axes	:	6
Nominal Load	:	2 kg
Maximum Load	:	5kg
Reach	:	920mm
Repeatability	:	+/-0.03mm
Control Unit	:	CS8c
Programming Language	:	VAL3
Weight	:	52.2kg
Manufacture	:	Stäubli Robotics

b)E-Field Probe

Model	:	EX3DV4
Serial No.	:	3825
Construction	:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)
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 probe axis)
Dynamic Range	:	10uW/g to > 100 mW/g;Linearity +/-0.2 dB(noise: typically < 1uW/g)
Dimensions	:	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application	:	Highprecision dosimetric measurement in any exposure scenario (e.g., very strong gradient fields).Only probe which enables compliance testing for frequencies up to 6GHz with precision of better 30%.
Manufacture	:	Schmid & Partner Engineering AG

EX3DV4 E-field Probe

c)Data Acquisition Electronic (DAE4)

Features	:	Signal amplifier, multiplexer, A/D converter and control logic Serial optical link for communication with DASY5 embedded system (fully remote controlled) Two step probe touch detector for mechanical surface detection and emergency robot stop
Measurement Range	:	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset voltage	:	< 5 μV (with auto zero)
Input Resistance	:	200 MΩ
Input Bias Current	:	< 50 fA
Battery Power	:	> 10 h of operation (with two 9.6 V NiMH accus)
Dimension	:	60 x 60 x 68 mm
Manufacture	:	Schmid & Partner Engineering AG

d)Electro-Optic Converter (EOC)

Version	:	EOC 61
Description	:	for TX60 robot arm, including proximity sensor
Manufacture	:	Schmid & Partner Engineering AG

e)DASY5 Measurement server

Features	:	Intel ULV Celeron 400MHz 128MB chip disk and 128MB RAM 16 Bit A/D converter for surface detection system Vacuum Fluorescent Display Robot Interface Serial link to DAE (with watchdog supervision) Door contact port (Possibility to connect a light curtain) Emergency stop port (to connect the remote control) Signal lamps port Light beam port Three Ethernet connection ports Two USB 2.0 Ports Two serial links Expansion port for future applications
Dimensions (L x W x H)	:	440 x 241 x 89 mm
Manufacture	:	Schmid & Partner Engineering AG

f) Light Beam Switches

Version	:	LB5
Dimensions (L x H)	:	110 x 80 mm
Thickness	:	12 mm
Beam-length	:	80 mm
Manufacture	:	Schmid & Partner Engineering AG

g)Software

Item	:	Dosimetric Assessment System DASY5
Type No.	:	SD 000 401A, SD 000 402A
Software version No.	:	DASY52, Version 52.6 (1)
Manufacture / Origin	:	Schmid & Partner Engineering AG

h)Robot Control Unit

Weight	:	70 Kg
AC Input Voltage	:	selectable
Manufacturer	:	Stäubli Robotics

i)Phantom and Device Holder

Phantom

Type	:	SAM Twin Phantom V4.0
Description	:	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.
Material	:	Vinylester, glass fiber reinforced (VE-GF)
Shell Material	:	Fiberglass
Thickness	:	2.0 +/-0.2 mm
Dimensions	:	Length: 1000 mm Width: 500 mm Height: adjustable feet
Volume	:	Approx. 25 liters
Manufacture	:	Schmid & Partner Engineering AG

Type	:	2mm Flat phantom ERI4.0
Description	:	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4.5 and higher and is compatible with all SPEAG dosimetric probes and dipoles.
Material	:	Vinylester, glass fiber reinforced (VE-GF)
Shell Thickness	:	2.0 ± 0.2 mm (sagging: <1%)
Filling Volume	:	approx. 30 liters
Dimensions	:	Major ellipse axis: 600 mm Minor axis: 400 mm
Manufacture	:	Schmid & Partner Engineering AG

Device Holder

In combination with the Twin SAM Phantom V4.0/V4.0c or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).

Material	:	POM

Laptio Extensions kit

Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (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 Phantoms.

Material	:	POM, Acrylic glass, Foam

Urethane

For this measurement, the urethane foam was used as device holder.

j)Simulated Tissues (Liquid)

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for required for routine SAR evaluation.

Mixture (%)	Frequency (MHz)									
	450		900		1800		1950		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.91	46.21	40.29	50.75	55.24	70.17	55.41	69.79	55.0	68.64
Sugar	56.93	51.17	57.90	48.21	-	-	-	-	-	-
Cellulose	0.25	0.18	0.24	0.00	-	-		-	-	-
Salt (NaCl)	3.79	2.34	1.38	0.94	0.31	0.39	0.08	0.2	-	-
Preventol	0.12	0.08	0.18	0.10	-				-	-
DGMBE	-	-	-	-	44.45	29.44	44.51	30.0	45.0	31.37
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Note:DGMBE(Diethylenglycol-monobuthyl ether)

The simulated tissue (liquid) of 1800MHz was used for the test frequency of 1700MHz to 1800MHz.

Mixture (%)	Frequency(MHz)	
	650&750	1450
Tissue Type	Head and Body	Head and Body
Water	35-58%	52-75%
Sugar	40-60%	-
Cellulose	<0.3%	-
Salt (NaCl)	0-6%	<1%
Preventol	0.1-0.7%	-
DGMBE	-	25-48%

Mixture (%)	Frequency(MHz)	
	5800	
Tissue Type	Head	Body
Water	64.0	78.0
Mineral Oil	18.0	11.0
Emulsifiers	15.0	9.0
Additives and salt	3.0	2.0

3. Dosimetric E-Field Probe Calibration (EX3DV4, S/N: 3825)

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

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

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

Accreditation No.: SCS 0108

Client UL Japan (Vitec)

Certificate No: EX3-3825_Dec15

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3825

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: December 11, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 15, 2015