SAR EVALUATION REPORT

For

NVIDIA CORPORATION

2701 San Tomas Expressway,

Santa Clara, CA 95050, USA

FCC ID: VOB-P2290W
IC: 7361A-P2290W

Report Type:	**Product Type:**
Original Report	Tablet

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Report Number:	R1511101-SAR
Report Date:	2016-04-01
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Summary of Test Results			
Rule Part(s):	FCC §2.1093, IC RSS-102 Issue 5		
Test Procedure(s):	IEEE 1528: 2013, KDB 248227, KDB 447498, KDB 865664, KDB 616217, IEC 62209-2:2010		
Device Category: Exposure Category:	Portable Device General Population/Uncontrolled Exposure		
Device Type:	Portable Device		
Modulation Type:	CCK, OFDM, FHSS		
TX Frequency Range:	802.11b/g/n: 2412-2472 MHz 802.11a/n/ac: 5180-5240 MHz, 5260-5320 MHz, 5500-5700 MHz (FCC), 5500-5580 MHz (IC), 5660-5700 MHz (IC), 5745-5825 MHz Bluetooth: 2402-2480 MHz BLE:2402-2480 MHz		
Maximum Conducted Power:	Bluetooth: 10.74 dBm 802.11b/g/n: 17.26 dBm	2.4 GHz	
	802.11a/n/ac: 12.19 dBm	5.2 GHz	
	802.11a/n/ac: 12.75 dBm	5.3 GHz	
	802.11a/n/ac: 12.87 dBm	5.6 GHz	
	802.11a/n/ac: 13.5 dBm	5.8 GHz	
Antenna Type(s) Tested:	Internal Antennas		
Body-Worn Accessories:	None		
Face-Head Accessories:	None		
Battery Type (s) Tested:	Li-Ion: 3.8V/5100mAh		
Max. SAR Level (s) Measured:	**Level (W/Kg)**	**Position**	**Operational Mode**
	1.54	Back Side Touch	2.4 GHz
	Level (W/Kg)	**Position**	**Operational Mode**
	1.45	Top Side Touch	5.2 GHz
	Level (W/Kg)	**Position**	**Operational Mode**
	1.45	Top Side Touch	5.3 GHz
	Level (W/Kg)	**Position**	**Operational Mode**
	1.44	Top Side Touch	5.6 GHz
	Level (W/Kg)	**Position**	**Operational Mode**
	1.44	Top Side Touch	5.8 GHz
	Level (W/Kg)	**Position**	**Operational Mode**
	1.609 (SPLSR=0.04)	-	Simultaneous

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1511101-SAR	Original Report	2016-04-01

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *NVIDIA CORPORATION,* and their product, FCC ID: VOB-P2290W; IC: 7361A-P2290W, model: *P2290W* or the "EUT" as referred to in this report, is a Tablet with WLAN and Bluetooth Functionalities.

1.2 EUT Technical Specification

Item	Description	
Modulation	DSSS, OFDM, FHSS	
Frequency Range	802.11b/g/n: 2412-2472 MHz 802.11a/n/ac: 5180-5240 MHz, 5260-5320 MHz, 5500-5700 MHz (FCC), 5500-5580 MHz (IC), 5660-5700 MHz (IC), 5745-5825 MHz Bluetooth: 2402-2480 MHz BLE:2402-2480 MHz	
Maximum Conducted Power Tested:	Bluetooth: 10.74 dBm 802.11b/g/n: 17.26 dBm	2.4 GHz
	802.11a/n/ac: 12.19 dBm	5.2 GHz
	802.11a/n/ac: 12.75 dBm	5.3 GHz
	802.11a/n/ac: 12.87 dBm	5.6 GHz
	802.11a/n/ac: 13.5 dBm	5.8 GHz
Dimensions (L*W*H)	Tablet: 218 mm (L) x 123 mm (W) x 8 mm (H)	
Power Source	Li-Ion: 3.8V/5100mAh	
Weight	350 g	
Normal Operation	Body-worn	

The test data gathered are from typical production sample, product S/N: 0424515000201 provided by the manufacturer.

2 Test Facility

Bay area compliance Laboratories Corp. (BACL) is:
1- An independent Commercial Test Laboratory accredited to **ISO 17025:2005** by **A2LA**, in the fields of: Electromagnetic Compatibility & Telecommunications covering Emissions, Immunity, Radio, RF Exposure, Safety and Telecom. This includes NEBS (Network Equipment Building System), Wireless RF, Telecommunications Terminal Equipment (TTE); Network Equipment; Information Technology Equipment (ITE); Medical Electrical Equipment; Industrial, Commercial, and Medical Test Equipment; Professional Audio and Video Equipment; Electronic (Digital) Products; Industrial and Scientific Instruments; Cabled Distribution Systems and Energy Efficiency Lighting.

2- An ENERGY STAR Recognized Laboratory, for the LM80 Testing, a wide variety of Luminares and Computers.

3- A NIST Designated Phase-I and Phase-II CAB including: ACMA (Australian Communication and Media Authority), BSMI (Bureau of Standards, Metrology and Inspection of Taiwan), IDA (Infocomm Development Authority of Singapore), IC(Industry Canada), Korea (Ministry of Communications Radio Research Laboratory), NCC (Formerly DGT; Directorate General of Telecommunication of Chinese Taipei) OFTA (Office of the Telecommunications Authority of Hong Kong), Vietnam, VCCI - Voluntary Control Council for Interference of Japan and a designated EU CAB (Conformity Assessment Body) (Notified Body) for the EMC and R&TTE Directives.

4- A Product Certification Body accredited to **ISO Guide 65:1996** by **A2LA** to certify:
1- Unlicensed, Licensed radio frequency devices and Telephone Terminal Equipment for the FCC. Scope A1, A2, A3, A4, B1, B2, B3, B4 & C.
2. Radio Standards Specifications (RSS) in the Category I Equipment Standards List and All Broadcasting Technical Standards (BETS) in Category I Equipment Standards List for Industry Canada.
3. Radio Communication Equipment for Singapore.
4. Radio Equipment Specifications, GMDSS Marine Radio Equipment Specifications, and Fixed Network Equipment Specifications for Hong Kong.
5. Japan MIC Telecommunication Business Law (A1, A2) and Radio Law (B1, B2 and B3).
6. Audio/Video, Battery Charging Systems, Computers, Displays, Enterprise Servers, Imaging Equipment, Set-Top Boxes, Telephony, Televisions, Ceiling Fans, CFLs (Including GU24s),Decorative Light Strings, Integral LED Lamps, Luminaires, Residential Ventilating Fans.

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2009, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for Laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at

http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

3 Reference, Standards and Guidelines

FCC:

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

CE:

The CE requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by the EN50360 for an uncontrolled environment. According to the Standard, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits? SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in Europe is 2 mW/g average over 10 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

3.1 SAR Limits

FCC/IC Limit

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

CE Limit

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 10 g of tissue)	2.0	10
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

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

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

General Population/Uncontrolled environments Spatial Peak limit 1.6 W/kg (FCC) & 2 W/kg (CE) applied to the EUT.

4 Equipment List and Calibration

4.1 Equipment List & Calibration Info

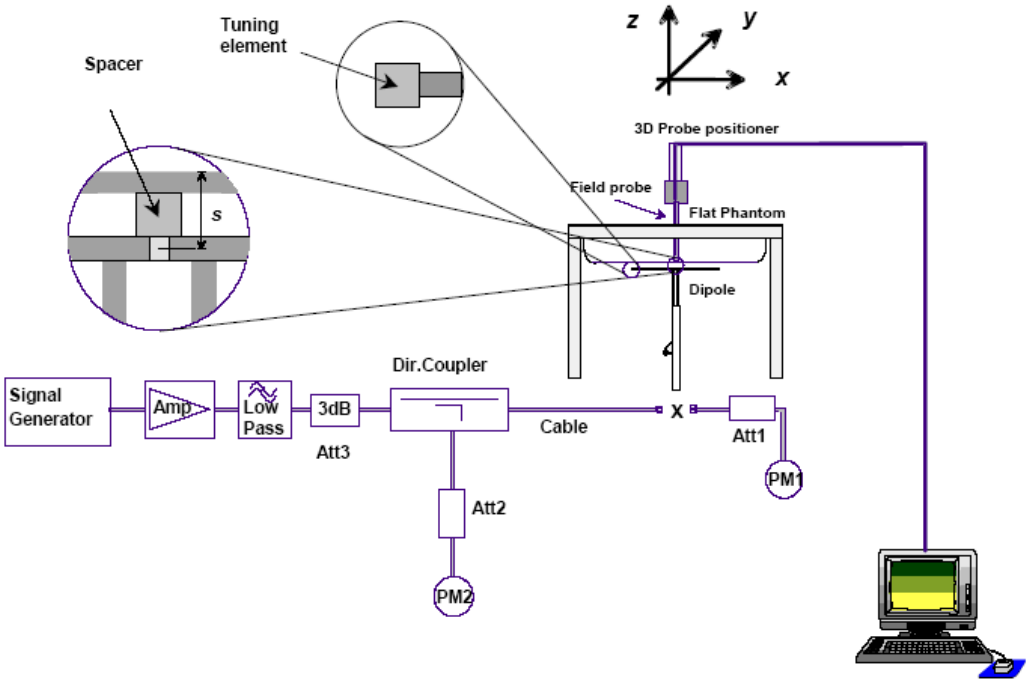
Type/Model	Cal. Due Date	S/N
DASY4 Professional Dosimetric System	N/A	N/A
Robot RX60L	N/A	CS7MBSP / 467
Robot Controller	N/A	F01/5J72A1/A/01
Dell Computer Dimension 3000	N/A	N/A
SPEAG EDC3	N/A	N/A
SPEAG DAE4	2016-08-18	530
DASY4 Measurement Server	N/A	1176
Schmid & Partner ES3DV2	2016-08-19	3019
SPEAG E-Field Probe EX3DV4	2016-10-20	3619
Antenna, Dipole, D-2450-S-1	2017-08-19	BCL-141
Antenna, Dipole, D5100V2	2017-08-19	1001
SPEAG Twin SAM Phantom	N/A	TP-1032
Muscle Equivalent Matter (2450 MHz)	Each Time	N/A
Muscle Equivalent Matter (5 GHz)	Each Time	N/A
Agilent, Spectrum Analyzer E4440A	2016-06-22	MY44303352
Mini Circuits, AMPLIFIER ZHL-42	2016-11-05	QA1326001
Power Sensor Agilent E9304A	2016-08-14	MY54280008
Power Sensor Agilent E9304A	2016-08-14	MY54280006
Dielectric Probe Kit HP85070A	N/A	US99360201
HP, Signal Generator, 83650B	2016-08-18	3614A00276
Mini Circuits, AMPLIFIER ZVE-8G+	2016-11-05	N605601404

5 SAR Measurement System Verification

5.1 System Accuracy Verification

SAR system verification is required to confirm measurement accuracy. The system verification must be performed for each frequency band. A system verification must be performed before each series of SAR measurements.

5.2 SAR System Verification Setup and procedure



Procedure:

1) The SAR system verification measurements were performed in the flat section of TWIN SAM or flat phantom with shell thickness of 2±0.2mm filled with head or body liquid.

2) The depth of liquid in phantom must be ≥15 cm for SAR measurement less than 3 GHz and ≥10 cm for SAR measurement above 3 GHz.

3) The dipole was mounted below the center of flat phantom, and oriented parallel to the Y-Axis. The standard measurement distance is 15mm (below 1 GHz) and 10mm (above 1 GHz) from dipole center to the liquid surface.

4) The dipole input power was 250 mW or 100 mW.

5) The SAR results are normalized to 1 Watt input power.

6) Compared the normalized the SAR results to the dipole calibration results.

5.3 Liquid and System Validation

Date	Simulant	Freq. [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation [%]	Limits [%]
2016-01-03	Body	2450	εr	22	52.7	53.26	1.1	± 5
			σ	22	1.95	2.00	2.6	± 5
			1g SAR	22	56.519	58.8	4.0	± 10

Date	Simulant	Freq. [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation [%]	Limits [%]
2016-01-05	Body	5250	εr	22	48.95	47.7	-2.6	± 5
			σ	22	5.36	5.12	-4.5	± 5
			1g SAR	22	75.9	69.6	-8.3	± 10

Date	Simulant	Freq. [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation [%]	Limits [%]
2016-01-07	Body	5600	εr	22	48.47	46.65	-3.8	± 5
			σ	22	5.77	5.63	-2.4	± 5
			1g SAR	22	80.5	75.7	-6.0	± 10

Date	Simulant	Freq. [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation [%]	Limits [%]
2016-01-10	Body	5800	εr	22	48.2	46.16	-4.2	± 5
			σ	22	6.0	5.92	-1.3	± 5
			1g SAR	22	75.6	71.5	-5.4	± 10

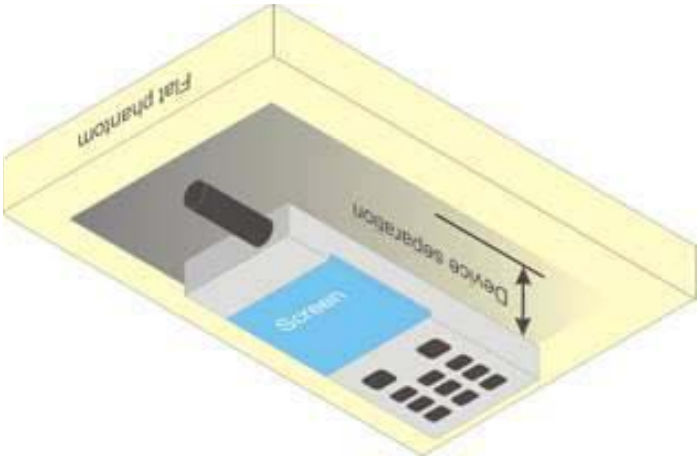
εr = relative permittivity, σ = conductivity and ρ=1000 kg/m^3

6 EUT Test Strategy and Methodology

6.1 Test positions for body-worn and other configurations

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. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.



6.2 SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or EUT and the horizontal grid spacing was 15 mm x 15 mm. Based on these data, the area of the maximum absorption was determined by line interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 30 mm x 30 mm x 21 mm was assessed by measuring 5 x 5 x 7 points. 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 1.2 mm 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. 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). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.

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

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

6.3 Test Methodology

- KDB 447498 D01 (General SAR Guidance)
- KDB 648474 D01 (SAR Handsets Multi Xmitter and Ant)
- KDB 248227 D01 (SAR Consideration for 802.11 Devices)
- KDB 865664 D01 (SAR Measurements up to 6 GHz)
- KDB 616217 D04 (Tablet SAR Considerations)

7 DASY4 SAR Evaluation Procedure

7.1 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurement jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. By default, the Minimum distance of probe sensors to surface is 4mm. This distance can be modified by the user, but cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 2.7mm for an ET3DV6 probe type).

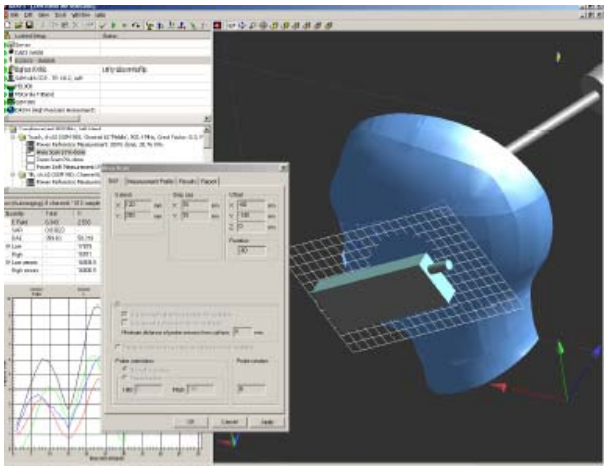
7.2 Area Scan

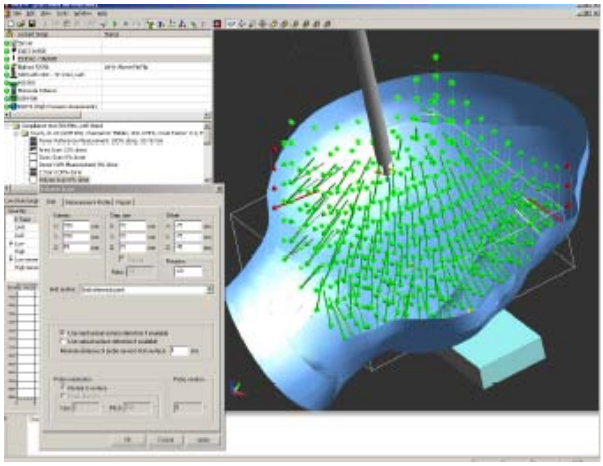
The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids.

The scanning area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the Area Scan's property sheet is brought-up, grid settings can be edited by a user.

When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2003, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

After measurement is completed, all maxima and their coordinates are listed in the Results property page. The maximum selected in the list is highlighted in the 3-D view. For the secondary maxima returned from an Area Scan, the user can specify a lower limit (peak SAR value), in addition to the Find secondary maxima within x dB condition. Only the primary maximum and any secondary maxima within x dB from the primary maximum and above this limit will be measured.





7.3 Zoom Scan

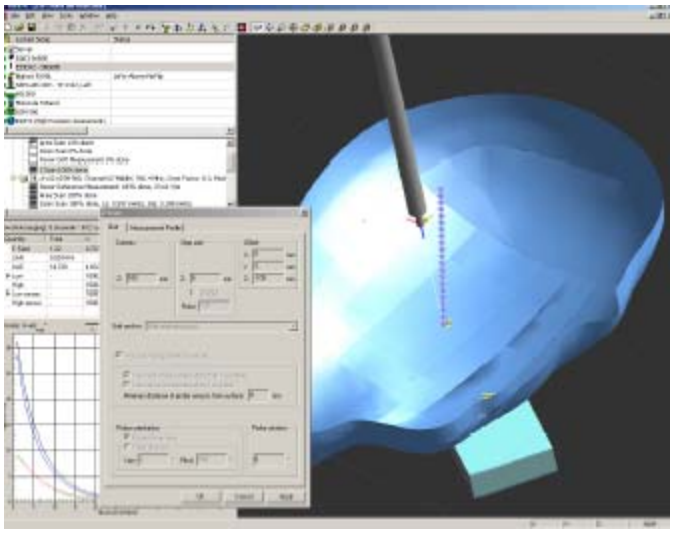
Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan measures 5 x 5 x 7 points within a cube whose base faces are centered around the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

7.4 Power drift measurement

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

7.5 Z-Scan

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



8 Description of Test System

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG) which is the fourth generation of the system shown in the figure hereinafter:

The system is based on a high precision robot (working range greater than 0.9m), which positions the probes with a positional repeatability of better than ±0.02mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit.

The SAR measurements were conducted with the dosimetric probe ET3DV6 SN: 1604 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure with accuracy of better than ±10%. The spherical isotropy was evaluated with the procedure and found to be better than ±0.25dB.

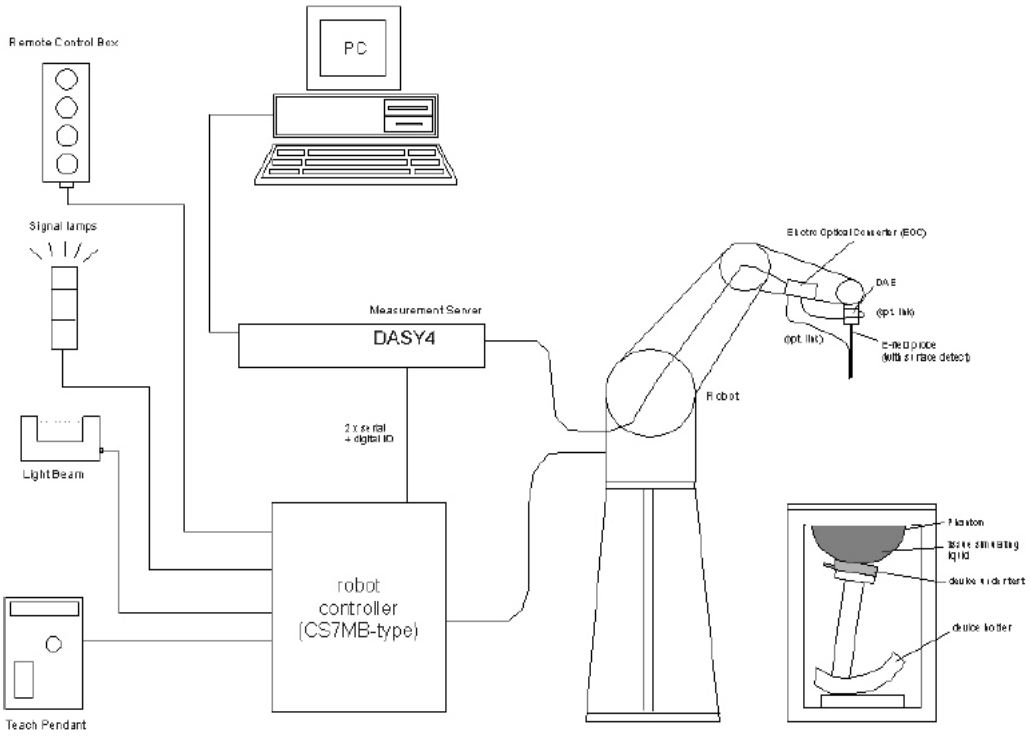
8.1 IEEE SCC-34/SC-2 P1528 Recommended Tissue Dielectric Parameters

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

8.2 DAY4 user's Manual Recommended Tissue Dielectric Parameters

Frequency (MHz)	Head Tissue		Body Tissue	
	εr	Ơ (S/m)	εr	Ơ (S/m)
2450	39.2	1.8	52.7	1.95
5200	36.0	4.66	49.0	5.30
5500	35.6	4.96	48.6	5.65
5800	35.3	5.27	48.2	6.00

8.3 Measurement System Diagram



The DASY4 system for performing compliance tests consists of the following items:

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

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

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

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

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

• A probe alignment unit which improves the (absolute) accuracy of the probe positioning.

• A computer operating Windows 2000 or Windows XP.

• DASY4 software.

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

• The SAM twin phantom enabling testing left-hand and right-hand usage.

• The device holder for handheld mobile phones.

• Tissue simulating liquid mixed according to the given recipes.

• Validation dipole kits allowing system validation.

8.4 System Components

• DASY4 Measurement Server
• Data Acquisition Electronics
• Probes
• Light Beam Unit
• Medium
• SAM Twin Phantom
• Device Holder for SAM Twin Phantom
• System Validation Kits
• Robot

DASY4 Measurement Server

The DASY4 measurement server is based on a PC/104 CPU board with a 166MHz low-power Pentium, 32MB chip disk and 64MB RAM. The necessary circuits for communication with either the DAE4 (or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pin out and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server.

Data Acquisition Electronics

The data acquisition electronics DAE3 consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

Probes

The DASY system can support many different probe types.

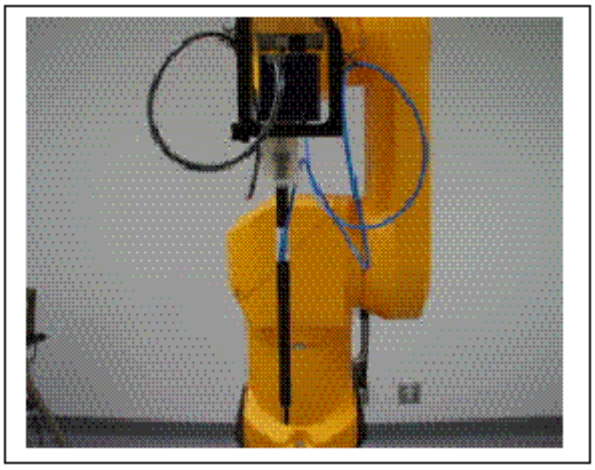
Dosimetric Probes: These probes are specially designed and calibrated for use in liquids with high permittivities. They should not be used in air, since the spherical isotropy in air is poor (±2 dB). The dosimetric probes have special calibrations in various liquids at different frequencies.

Free Space Probes: These are electric and magnetic field probes specially designed for measurements in free space. The z-sensor is aligned to the probe axis and the rotation angle of the x-sensor is specified. This allows the DASY system to automatically align the probe to the measurement grid for field component measurement. The free space probes are generally not calibrated in liquid. (The H-field probes can be used in liquids without any change of parameters.)

Temperature Probes: Small and sensitive temperature probes for general use. They use a completely different parameter set and different evaluation procedures. Temperature rise features allow direct SAR evaluations with these probes.

ET3DV6 Probe Specification

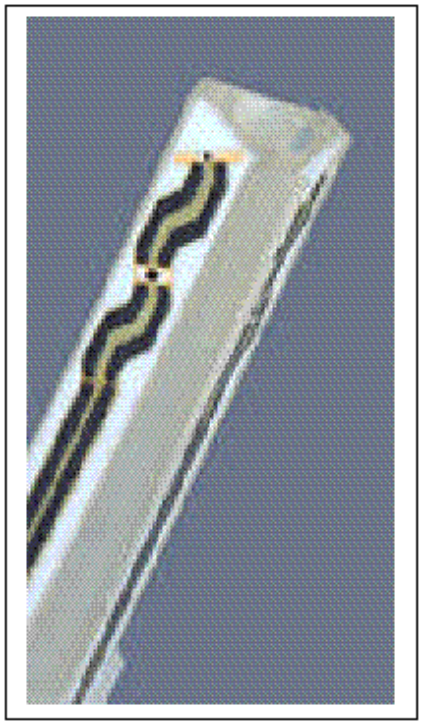
Construction Symmetrical design with triangular core
Built-in optical fiber for surface detection System
Built-in shielding against static charges
Calibration In air from 10 MHz to 2.5 GHz
In brain and muscle simulating tissue at
Frequencies of 450 MHz, 900 MHz and
1.8 GHz (accuracy ± 8%)
Frequency 10 MHz to > 6 GHz; Linearity: ± 0.2 dB
(30 MHz to 3 GHz)
Directivity ± 0.2 dB in brain tissue (rotation around
probe axis)
± 0.4 dB in brain tissue (rotation normal probe axis)
Dynamic 5 mW/g to > 100 mW/g;
Range Linearity: ± 0.2 dB
Surface ± 0.2 mm repeatability in air and clear liquids
Detection over diffuse reflecting surfaces.
Dimensions Overall length: 330 mm
Tip length: 16 mm



Photograph of the probe

Body diameter: 12 mm
Tip diameter: 6.8 mm
Distance from probe tip to dipole centers: 2.7 mm
Application General dosimetric up to 3 GHz
Compliance tests of mobile phones
Fast automatic scanning in arbitrary phantoms

The SAR measurements were conducted with the dosimetric probe ET3DV6 designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY3 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped when reaching the maximum.



Inside view of ET3DV6 E-field Probe

E-Field Probe Calibration Process

Each probe is calibrated according to a dosimetric assessment procedure described in [6] with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in [7] and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

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

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

Data Evaluation

The DASY4 post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

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

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.
The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

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

With Vi = compensated signal of channel i (i =x, y, z)
Ui = input signal of channel i (i =x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

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

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

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

With Vi = compensated signal of channel i (i =x, y, z)
$Norm_i$ = sensor sensitivity of channel i (i =x, y, z)
$\mu V/(V/m)^2$ for E-field probes
ConF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strenggy of channel i in V/m
H_i = diode compression point (DASY parameter)

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

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

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

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

With SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/meter] or [Siemens/meter]
ρ = equivalent tissue density in g/cm^3

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

Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, so that the robot coordinates are valid for the probe tip. The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

Medium

Parameters

The parameters of the tissue simulating liquid strongly influence the SAR in the liquid. The parameters for the different frequencies are defined in the corresponding compliance standards (e.g., EN 50361, IEEE 1528-2003).

Parameter measurements

Several measurement systems are available for measuring the dielectric parameters of liquids:

- The open coax test method (e.g., HP85070 dielectric probe kit) is easy to use, but has only moderate acuracy. It is calibrated with open, short, and deionized water and the calibrations a critical process.

- The transmission line method (e.g., model 1500T from DAMASKOS, INC.) measures the transmission and reflection in a liquid filled high precision line. It needs standard two port calibration and is probably more accurate than the open coax method.

- The reflection line method measures the reflection in a liquid filled shorted precision lined.The method is not suitable for these liquids because of its low sensitivity.

- The slotted line method scans the field magnitude and phase along a liquid filled line. The evaluation is straight forward and only needs a simple response calibration. The method is very accurate, but can only be used in high loss liquids and at frequencies above 100 to 200MHz. Cleaning the line can be tedious.

SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:

- Left hand
- Right hand
- Flat phantom

The phantom table comes in two sizes: A 100 x 50 x 85 cm (L x W x H) table for use with free standing robots (DASY4 professional system option) or as a second phantom and a 100 x 75 x 85 cm(L x W x H) table with reinforcements for table mounted robots (DASY4 compact system option) .
The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. Only one device holder is necessary if two phantoms are used (e.g., for different liquids) A white cover is provided to tap the phantom during o_-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on the cover are possible. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

The phantom can be used with the following tissue simulating liquids:

- Water-sugar based liquids can be left permanently in the phantom. Always cover the liquid if the system is not used, otherwise the parameters will change due to water evaporation.

- Glycol based liquids should be used with care. As glycol is a softener for most plastics, the liquid should be taken out of the phantom and the phantom should be dried when the system is not used (desirable at least once a week).

- Do not use other organic solvents without previously testing the phantom's compatibility.

Device Holder for SAM Twin Phantom

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source in 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. An accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions, in which the devices must be measured, are defined by the standards.

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the 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 DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity "=3 and loss tangent _=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

System Validation Kits

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. For that purpose a well defined SAR distribution in the flat section of the SAM twin phantom is produced.

System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder. Dipoles are available for the variety of frequencies between 300MHz and 6 GHz (dipoles for other frequencies or media and other calibration conditions are available upon request).

The dipoles are highly symmetric and matched at the center frequency for the specified liquid and distance to the flat phantom (or flat section of the SAM-twin phantom). The accurate distance between the liquid surface and the dipole center is achieved with a distance holder that snaps on the dipole.

Robot

The DASY4 system uses the high precision industrial robots RX60L, RX90 and RX90L, as well as the RX60BL and RX90BL types out of the newer series from Stäubli SA (France). The RX robot series offers many features that are important for our application:

• High precision (repeatability 0.02mm)
• High reliability (industrial design)
• Low maintenance costs (virtually maintenance-free due to direct drive gears; no belt drives)
• Jerk-free straight movements (brushless synchronous motors; no stepper motors)
• Low ELF interference (the closed metallic construction shields against motor control fields)

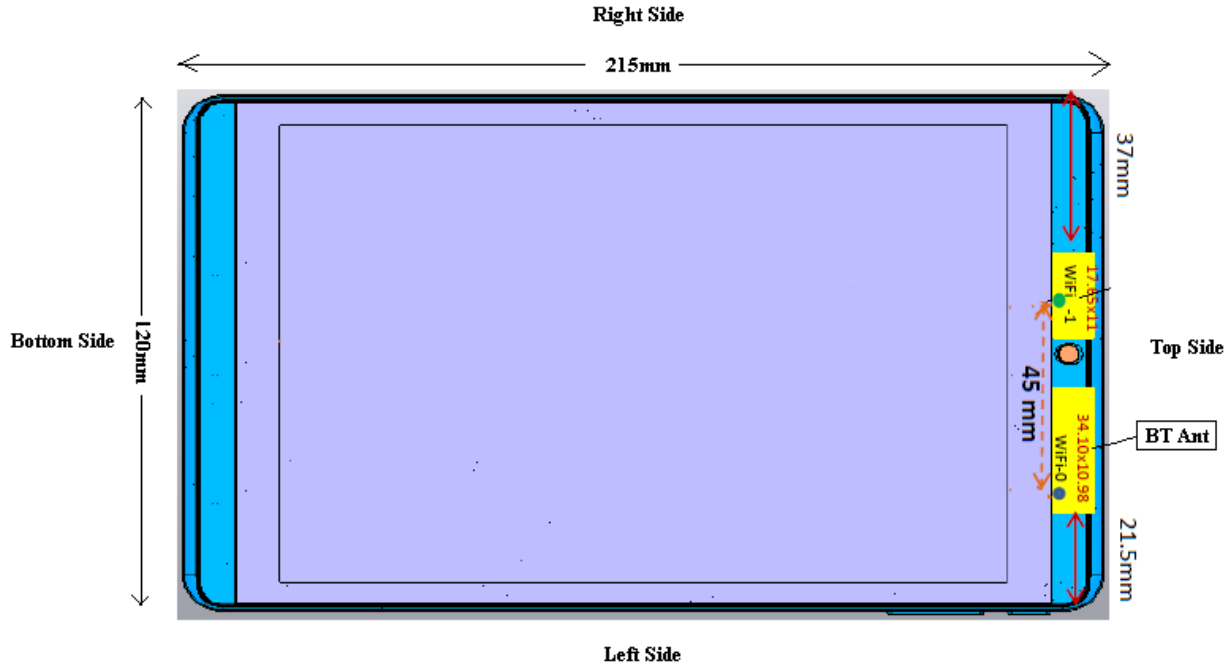
For the newly delivered DASY4 systems as well as for the older DASY3 systems delivered since 1999, the CS7MB robot controller version from Stäubli is used. Previously delivered systems have either a CS7 or CS7M controller; the differences to the CS7MB are mainly in the hardware, but some procedures in the robot software from Stäubli are also not completely the same. The following descriptions about robot hard- and software correspond to CS7MB controller with software version 13.1 (edit S5). The actual commands, procedures and configurations, also including details in hardware, might differ if an older robot controller is in use. In this case please also refer to the Stäubli manuals for further information.

9 SAR Measurement Consideration and Reduction

9.1 SAR Reductions

EUT Antennas Location

(Front Side View)



Note:

Reduced[1]

According to KDB 248227 Section 5.2.1, when the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration. When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

Reduced[2]

According to KDB 248227 Section 5.3.4 (b), when the highest reported SAR for the initial test configuration, according to the initial test position or fixed exposure position requirements, is adjusted by the ratio of the subsequent test configuration to initial test configuration specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for that subsequent test configuration.

Reduced[3]

According to KDB 447498 Section 4.3.1 (b), based on the SAR test Exclusion Thresholds for 100MHz-6GHz and >50mm. When the power lower than the thresholds, the testing is not required. Calculation details are shown in the tables below.

2.4 GHz Band							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Exclusion Threshold (mW)**
BT/BLE	0	Bottom	2441	10.74	11.86	204	1636.01
		Right	2441	10.74	11.86	65.4	250.01
802.11b	0	Bottom	2452	17.26	53.21	204	1635.79
		Right	2452	17.26	53.21	65.4	249.79
	1	Bottom	2467	17	50.12	204	1635.50
		Left	2467	17	50.12	66.35	259
802.11g	0	Bottom	2412	16.28	42.46	204	1636.58
		Right	2412	16.28	42.46	65.4	250.58
	1	Bottom	2457	16	39.81	204	1635.69
		Left	2457	16	39.81	66.35	259.19
802.11n20	0	Bottom	2417	16.25	42.17	204	1636.48
	1	Bottom	2457	16.12	40.93	204	1635.69
802.11n40	0	Bottom	2437	14.89	30.83	204	1636.09
	1	Bottom	2437	14.52	28.31	204	1636.09
5.2 GHz Band							
802.11a	0	Bottom	5220	12.19	16.56	204	1605.65
		Right	5220	12.19	16.56	65.4	219.65
	1	Bottom	5240	11	12.59	204	1605.53
		Left	5240	11	12.59	66.35	229.03
802.11n20	0	Bottom	5220	11.03	12.68	204	1605.65
		Right	5220	11.03	12.68	65.4	219.65
	1	Bottom	5240	11	12.59	204	1605.53
		Left	5240	11	12.59	66.35	229.03
802.11ac20	0	Bottom	5240	11	12.59	204	1605.53
		Right	5240	11	12.59	65.4	219.53
	1	Bottom	5220	11	12.59	204	1605.65
		Left	5220	11	12.59	66.35	229.15
802.11n40	0	Bottom	5230	11.04	12.71	204	1605.59
		Right	5230	11.04	12.71	65.4	219.59
	1	Bottom	5230	11	12.59	204	1605.59
		Left	5230	11	12.59	66.35	229.09
802.11ac40	0	Bottom	5230	11	12.59	204	1605.59
		Right	5230	11	12.59	65.4	219.59
	1	Bottom	5230	11.02	12.65	204	1605.59
		Left	5230	11.02	12.65	66.35	229.09
802.11ac80	0	Bottom	5210	11	12.59	204	1605.72
		Right	5210	11	12.59	65.4	219.72
	1	Bottom	5210	11	12.59	204	1605.72
		Left	5210	11	12.59	66.35	229.22

5.3 GHz Band							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Exclusion Threshold (mW)**
802.11a	0	Bottom	5320	12.5	17.78	204	1605.03
		Right	5320	12.5	17.78	65.4	219.03
	1	Bottom	5320	11	12.59	204	1605.03
		Left	5320	11	12.59	66.35	228.53
802.11n20	0	Bottom	5320	12.5	17.78	204	1605.03
		Right	5320	12.5	17.78	65.4	219.03
	1	Bottom	5320	11	12.59	204	1605.03
		Left	5320	11	12.59	66.35	228.53
802.11ac20	0	Bottom	5320	12.5	17.78	204	1605.03
		Right	5320	12.5	17.78	65.4	219.03
	1	Bottom	5320	11.02	12.65	204	1605.03
		Left	5320	11.02	12.65	66.35	228.53
802.11n40	0	Bottom	5310	12.5	18.84	204	1605.09
		Right	5310	12.5	18.84	65.4	219.09
	1	Bottom	5270	11.01	12.62	204	1605.34
		Left	5270	11.01	12.62	66.35	228.84
802.11ac40	0	Bottom	5310	12.66	18.45	204	1605.09
		Right	5310	12.66	18.45	65.4	219.09
	1	Bottom	5310	11.2	13.18	204	1605.09
		Left	5310	11.2	13.18	66.35	228.59
802.11ac80	0	Bottom	5290	12.2	16.60	204	1605.22
		Right	5290	12.2	16.60	65.4	219.22
	1	Bottom	5290	10.64	11.59	204	1605.22
		Left	5290	10.64	11.59	66.35	228.72

5.6 GHz Band							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Exclusion Threshold (mW)**
802.11a	0	Bottom	5700	13	19.95	204	1605.83
		Right	5700	13	19.95	65.4	216.83
	1	Bottom	5700	11.26	13.37	204	1602.83
		Left	5700	11.26	13.37	66.35	226.33
802.11n20	0	Bottom	5700	12.76	18.88	204	1602.83
		Right	5700	12.76	18.88	65.4	216.83
	1	Bottom	5700	11.14	13.00	204	1602.83
		Left	5700	11.14	13.00	66.35	226.33
802.11ac20	0	Bottom	5700	12.7	18.62	204	1602.83
		Right	5700	12.7	18.62	65.4	216.83
	1	Bottom	5700	11.22	13.24	204	1602.83
		Left	5700	11.22	13.24	66.35	226.33
802.11n40	0	Bottom	5670	10.5	11.22	204	1602.99
		Right	5670	10.5	11.22	65.4	216.99
	1	Bottom	5510	10.68	11.69	204	1603.90
		Left	5510	10.68	11.69	66.35	227.40
802.11ac40	0	Bottom	5670	10.5	11.22	204	1602.99
		Right	5670	10.5	11.22	65.4	216.99
	1	Bottom	5510	10.6	11.48	204	1603.90
		Left	5510	10.6	11.48	66.35	227.40
802.11ac80	0	Bottom	5610	10	10.00	204	1603.33
		Right	5610	10	10.00	65.4	217.33
	1	Bottom	5530	10.1	10.23	204	1603.79
		Left	5530	10.1	10.23	66.35	227.29

5.8 GHz Band							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Exclusion Threshold (mW)**
802.11a	0	Bottom	5745	13.5	22.39	204	1602.58
		Right	5745	13.5	22.39	65.4	216.58
	1	Bottom	5825	12.83	19.19	204	1602.15
		Left	5825	12.83	19.19	66.35	225.65
802.11n20	0	Bottom	5745	13.5	22.39	204	1602.58
		Right	5745	13.5	22.39	65.4	216.58
	1	Bottom	5785	12.5	17.78	204	1602.36
		Left	5785	12.5	17.78	66.35	225.86
802.11ac20	0	Bottom	5745	13.5	22.39	204	1602.58
		Right	5745	13.5	22.39	65.4	216.58
	1	Bottom	5785	12.5	17.78	204	1602.36
		Left	5785	12.5	17.78	66.35	225.86
802.11n40	0	Bottom	5755	13.5	22.39	204	1602.53
		Right	5755	13.5	22.39	65.4	216.53
	1	Bottom	5755	12.5	17.78	204	1602.53
		Left	5755	12.5	17.78	66.35	226.03
802.11ac40	0	Bottom	5755	13.5	22.39	204	1602.53
		Right	5755	13.5	22.39	65.4	216.53
	1	Bottom	5755	12.5	17.78	204	1602.53
		Left	5755	12.5	17.78	66.35	226.03
802.11ac80	0	Bottom	5775	13.1	20.42	204	1602.42
		Right	5775	13.1	20.42	65.4	216.42
	1	Bottom	5775	12.5	17.78	204	1602.42
		Left	5775	12.5	17.78	66.35	225.92

Reduced[4]

According to KDB 248227 Section 5.2.2, in 2.4 GHz frequency band, 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, SAR for OFDM is not required.

Reduced[5]

According to KDB 248227 Section 5.3.3, OFDM when the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg or all required channels are tested.

Reduced[6]

According to KDB 248227 Section 5.3.1, U-NII-1 and U-NII-2 bands, When different maximum output power is specified for the bands, begin SAR measurement in the band with higher specified maximum output power. The highest reported SAR for the tested configuration is adjusted by the ratio of lower to higher specified maximum output power for the two bands. When the adjusted SAR is ≤ 1.2 W/kg, SAR is not required for the band with lower maximum output power in that test configuration.

Reduced[7]

According to 447498 Section 4.3.1 (a), for 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds 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. Calculation details are shown in the tables below.

Bluetooth/BLE							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Exclusion Threshold**
BT/BLE	0	Left	2441	10.74	11.86	21.5	0.86

5.2 GHz Band							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Exclusion Threshold**
802.11a	0	Left	5220	12.19	16.56	21.5	1.76
	1	Right	5240	11	12.59	37	0.79
802.11n20	0	Left	5220	11.03	12.68	21.5	1.35
	1	Right	5220	11	12.59	37	0.78
802.11ac20	0	Left	5240	11	12.59	21.5	1.34
	1	Right	5220	11	12.59	37	0.78
802.11n40	0	Left	5230	11.04	12.71	21.5	1.35
	1	Right	5230	11	12.59	37	0.78
802.11ac40	0	Left	5230	11	12.59	21.5	1.34
	1	Right	5230	11.02	12.65	37	0.72
802.11ac80	0	Left	5210	11	12.59	21.5	1.34
	1	Right	5210	11	12.59	37	0.78

5.3 GHz Band							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Exclusion Threshold**
802.11a	0	Left	5320	12.5	17.78	21.5	1.91
	1	Right	5320	11	12.59	37	0.78
802.11n20	0	Left	5320	12.5	17.78	21.5	1.91
	1	Right	5320	11	12.59	37	0.78
802.11ac20	0	Left	5320	12.5	17.78	21.5	1.91
	1	Right	5320	11.02	12.65	37	0.79
802.11n40	0	Left	5310	12.75	18.84	21.5	2.02
	1	Right	5270	11.01	12.62	37	0.78
802.11ac40	0	Left	5310	12.66	18.45	21.5	1.98
	1	Right	5310	11.2	13.18	37	0.82
802.11ac80	0	Left	5290	12.2	16.60	21.5	1.78
	1	Right	5290	10.64	11.59	37	0.72
5.6 GHz Band							
802.11a	0	Left	5700	13	19.95	21.5	2.21
	1	Right	5700	11.26	13.37	37	0.86
802.11n20	0	Left	5700	12.76	18.88	21.5	2.10
	1	Right	5700	11.14	13.00	37	0.84
802.11ac20	0	Left	5700	12.7	18.62	21.5	2.07
	1	Right	5700	11.22	13.24	37	0.85
802.11n40	0	Left	5670	10.5	11.22	21.5	1.23
	1	Right	5510	10.68	11.69	37	0.74
802.11ac40	0	Left	5670	10.5	11.22	21.5	1.24
	1	Right	5510	10.6	11.48	37	0.73
802.11ac80	0	Left	5610	10	10.00	21.5	1.10
	1	Right	5530	10.01	10.02	37	0.64
5.8 GHz Band							
802.11a	0	Left	5745	13.5	22.39	21.5	2.50
	1	Right	5825	12.83	19.19	37	1.25
802.11n20	0	Left	5745	13.5	22.39	21.5	2.50
	1	Right	5785	12.5	17.78	37	1.16
802.11ac20	0	Left	5745	13.5	22.39	21.5	2.50
	1	Right	5785	12.5	17.78	37	1.16
802.11n40	0	Left	5755	13.5	22.39	21.5	2.50
	1	Right	5755	12.5	17.78	37	1.15
802.11ac40	0	Left	5755	13.5	22.39	21.5	2.50
	1	Right	5755	12.5	17.78	37	1.15
802.11ac80	0	Left	5775	13.1	20.42	21.5	2.28
	1	Right	5775	12.5	17.78	37	1.15

9.2 SAR Consideration

Mode	Side	Channel	Result
2.4 GHz 802.11 b Antenna 0	Top Side	Low Channel-2412	Tested
		Mid Channel-2437	Tested
		High Channel-2452	Tested
	Bottom Side	Low Channel-2412	Reduced[3]
		Mid Channel-2437	Reduced[3]
		High Channel-2452	Reduced[3]
	Left Side	Low Channel-2412	Reduced[1]
		Mid Channel-2437	Tested
		High Channel-2452	Reduced[1]
	Right Side	Low Channel-2412	Reduced[3]
		Mid Channel-2437	Reduced[3]
		High Channel-2452	Reduced[3]
	Back Side	Low Channel-2412	Reduced[1]
		Mid Channel-2437	Tested
		High Channel-2452	Tested
2.4 GHz 802.11 b Antenna 1	Top Side	Low Channel-2412	Reduced[1]
		Mid Channel-2437	Tested
		High Channel-2467	Reduced[1]
	Bottom Side	Low Channel-2412	Reduced[3]
		Mid Channel-2437	Reduced[3]
		High Channel-2467	Reduced[3]
	Left Side	Low Channel-2412	Reduced[3]
		Mid Channel-2437	Reduced[3]
		High Channel-2467	Reduced[3]
	Right Side	Low Channel-2412	Reduced[1]
		Mid Channel-2437	Tested
		High Channel-2467	Reduced[1]
	Back Side	Low Channel-2412	Tested
		Mid Channel-2437	Tested
		High Channel-2467	Tested
2.4 GHz 802.11 g Antenna 1	Top Side	Low Channel-2412	Reduced[5]
		Mid Channel-2437	Tested
		High Channel-2457	Reduced[5]
	Bottom Side	Low Channel-2412	Reduced[3]
		Mid Channel-2437	Reduced[3]
		High Channel-2457	Reduced[3]
	Left Side	Low Channel-2412	Reduced[3]
		Mid Channel-2437	Reduced[3]
		High Channel-2457	Reduced[3]
	Right Side	Low Channel-2412	Reduced[5]
		Mid Channel-2437	Tested
		High Channel-2457	Reduced[5]
	Back Side	Low Channel-2412	Tested
		Mid Channel-2437	Tested
		High Channel-2457	Tested

Mode	Side	Channel	Result
2.4 GHz 802.11 g Antenna 0	Top Side	Low Channel-2412	Reduced[4]
		Mid Channel-2437	Reduced[4]
		High Channel-2462	Reduced[4]
	Bottom Side	Low Channel-2412	Reduced[3]
		Mid Channel-2437	Reduced[3]
		High Channel-2462	Reduced[3]
	Left Side	Low Channel-2412	Reduced[4]
		Mid Channel-2437	Reduced[4]
		High Channel-2462	Reduced[4]
	Right Side	Low Channel-2412	Reduced[3]
		Mid Channel-2437	Reduced[3]
		High Channel-2462	Reduced[3]
	Back Side	Low Channel-2412	Reduced[4]
		Mid Channel-2437	Reduced[4]
		High Channel-2462	Reduced[4]
2.4 GHz 802.11 n20 Antenna 0+1	Top Side	Low Channel-2417	Tested
		Mid Channel-2437	Tested
		High Channel-2457	Tested
	Bottom Side	Low Channel-2417	Reduced[3]
		Mid Channel-2437	Reduced[3]
		High Channel-2457	Reduced[3]
	Left Side	Low Channel-2417	Reduced[5]
		Mid Channel-2437	Tested
		High Channel-2457	Reduced[5]
	Right Side	Low Channel-2417	Reduced[5]
		Mid Channel-2437	Tested
		High Channel-2457	Reduced[5]
	Back Side	Low Channel-2417	Tested
		Mid Channel-2437	Tested
		High Channel-2457	Tested
2.4 GHz 802.11 n40 Antenna 0+1	Top Side	Low Channel-2422	Reduced[4]
		Mid Channel-2437	Reduced[4]
		High Channel-2452	Reduced[4]
	Bottom Side	Low Channel-2422	Reduced[3]
		Mid Channel-2437	Reduced[3]
		High Channel-2452	Reduced[3]
	Left Side	Low Channel-2422	Reduced[4]
		Mid Channel-2437	Reduced[4]
		High Channel-2452	Reduced[4]
	Right Side	Low Channel-2422	Reduced[4]
		Mid Channel-2437	Reduced[4]
		High Channel-2452	Reduced[4]
	Back Side	Low Channel-2422	Reduced[4]
		Mid Channel-2437	Reduced[4]
		High Channel-2452	Reduced[4]

Mode	Side	Channel	Result
2.4 GHz BT	Top Side	Low Channel-2402	Tested
		Mid Channel-2441	Tested
		High Channel-2480	Tested
	Bottom Side	Low Channel-2402	Reduced[3]
		Mid Channel-2441	Reduced[3]
		High Channel-2480	Reduced[3]
	Left Side	Low Channel-2402	Reduced[7]
		Mid Channel-2441	Reduced[7]
		High Channel-2480	Reduced[7]
	Right Side	Low Channel-2402	Reduced[3]
		Mid Channel-2441	Reduced[3]
		High Channel-2480	Reduced[3]
	Back Side	Low Channel-2402	Tested
		Mid Channel-2441	Tested
		High Channel-2480	Tested
2.4 GHz BLE	Top Side	Low Channel-2402	Tested
		Mid Channel-2440	Tested
		High Channel-2480	Tested
	Bottom Side	Low Channel-2402	Reduced[3]
		Mid Channel-2440	Reduced[3]
		High Channel-2480	Reduced[3]
	Left Side	Low Channel-2402	Reduced[7]
		Mid Channel-2440	Reduced[7]
		High Channel-2480	Reduced[7]
	Right Side	Low Channel-2402	Reduced[3]
		Mid Channel-2440	Reduced[3]
		High Channel-2480	Reduced[3]
	Back Side	Low Channel-2402	Tested
		Mid Channel-2440	Tested
		High Channel-2480	Tested

Mode	Side	Channel	Result
5.2 GHz 802.11 a Antenna 1	Top Side	Low Channel-5180	Tested
		Mid Channel-5220	Tested
		High Channel-5240	Tested
	Bottom Side	Low Channel-5180	Reduced[3]
		Mid Channel-5220	Reduced[3]
		High Channel-5240	Reduced[3]
	Left Side	Low Channel-5180	Reduced[3]
		Mid Channel-5220	Reduced[3]
		High Channel-5240	Reduced[3]
	Right Side	Low Channel-5180	Reduced[7]
		Mid Channel-5220	Reduced[7]
		High Channel-5240	Reduced[7]
	Back Side	Low Channel-5180	Reduced[2]
		Mid Channel-5200	Reduced[2]
		High Channel-5240	Reduced[2]
5.2 GHz 802.11 a Antenna 0	Top Side	Low Channel-5180	Reduced[2]
		Mid Channel-5220	Reduced[2]
		High Channel-5240	Reduced[2]
	Bottom Side	Low Channel-5180	Reduced[3]
		Mid Channel-5220	Reduced[3]
		High Channel-5240	Reduced[3]
	Left Side	Low Channel-5180	Reduced[7]
		Mid Channel-5220	Reduced[7]
		High Channel-5240	Reduced[7]
	Right Side	Low Channel-5180	Reduced[3]
		Mid Channel-5220	Reduced[3]
		High Channel-5240	Reduced[3]
	Back Side	Low Channel-5180	Reduced[2]
		Mid Channel-5220	Reduced[2]
		High Channel-5240	Reduced[2]
5.2 GHz 802.11 n20 Antenna 0+1	Top Side	Low Channel-5180	Tested
		Mid Channel-5220	Tested
		High Channel-5240	Tested
	Bottom Side	Low Channel-5180	Reduced[3]
		Mid Channel-5220	Reduced[3]
		High Channel-5240	Reduced[3]
	Left Side	Low Channel-5180	Reduced[7]
		Mid Channel-5220	Reduced[7]
		High Channel-5240	Reduced[7]
	Right Side	Low Channel-5180	Reduced[7]
		Mid Channel-5220	Reduced[7]
		High Channel-5240	Reduced[7]
	Back Side	Low Channel-5180	Reduced[2]
		Mid Channel-5220	Reduced[2]
		High Channel-5240	Reduced[2]

Mode	Side	Channel	Result
5.2 GHz 802.11 ac20 Antenna 0+1	Top Side	Low Channel-5180	Tested
		Mid Channel-5220	Tested
		High Channel-5240	Tested
	Bottom Side	Low Channel-5180	Reduced[3]
		Mid Channel-5220	Reduced[3]
		High Channel-5240	Reduced[3]
	Left Side	Low Channel-5180	Reduced[7]
		Mid Channel-5220	Reduced[7]
		High Channel-5240	Reduced[7]
	Right Side	Low Channel-5180	Reduced[7]
		Mid Channel-5220	Reduced[7]
		High Channel-5240	Reduced[7]
	Back Side	Low Channel-5180	Reduced[2]
		Mid Channel-5200	Reduced[2]
		High Channel-5240	Reduced[2]
5.2 GHz 802.11 n40 Antenna 0+1	Top Side	Low Channel-5190	Tested
		High Channel-5230	Tested
	Bottom Side	Low Channel-5190	Reduced[3]
		High Channel-5230	Reduced[3]
	Left Side	Low Channel-5190	Reduced[7]
		High Channel-5230	Reduced[7]
	Right Side	Low Channel-5190	Reduced[7]
		High Channel-5230	Reduced[7]
	Back Side	Low Channel-5190	Reduced[2]
		High Channel-5230	Reduced[2]
5.2 GHz 802.11 ac40 Antenna 0+1	Top Side	Low Channel-5190	Tested
		High Channel-5230	Tested
	Bottom Side	Low Channel-5190	Reduced[3]
		High Channel-5230	Reduced[3]
	Left Side	Low Channel-5190	Reduced[7]
		High Channel-5230	Reduced[7]
	Right Side	Low Channel-5190	Reduced[7]
		High Channel-5230	Reduced[7]
	Back Side	Low Channel-5190	Reduced[2]
		High Channel-5230	Reduced[2]
5.2 GHz 802.11 ac80 (Initial Configuration) Antenna 0+1	Top Side	Middle Channel-5210	Tested
	Bottom Side	Middle Channel-5210	Reduced[3]
	Left Side	Middle Channel-5210	Reduced[7]
	Right Side	Middle Channel-5210	Reduced[7]
	Back Side	Middle Channel-5210	Tested

Mode	Side	Channel	Result
5.3 GHz 802.11 a Antenna 1	Top Side	Low Channel-5260	Tested
		Mid Channel-5300	Tested
		High Channel-5320	Tested
	Bottom Side	Low Channel-5260	Reduced[3]
		Mid Channel-5300	Reduced[3]
		High Channel-5320	Reduced[3]
	Left Side	Low Channel-5260	Reduced[3]
		Mid Channel-5300	Reduced[3]
		High Channel-5320	Reduced[3]
	Right Side	Low Channel-5260	Reduced[7]
		Mid Channel-5300	Reduced[7]
		High Channel-5320	Reduced[7]
	Back Side	Low Channel-5260	Reduced[2]
		Mid Channel-5300	Reduced[2]
		High Channel-5320	Reduced[2]
5.3 GHz 802.11 a Antenna 0	Top Side	Low Channel-5260	Reduced[1]
		Mid Channel-5300	Tested
		High Channel-5320	Reduced[1]
	Bottom Side	Low Channel-5260	Reduced[3]
		Mid Channel-5300	Reduced[3]
		High Channel-5320	Reduced[3]
	Left Side	Low Channel-5260	Reduced[7]
		Mid Channel-5300	Reduced[7]
		High Channel-5320	Reduced[7]
	Right Side	Low Channel-5260	Reduced[3]
		Mid Channel-5300	Reduced[3]
		High Channel-5320	Reduced[3]
	Back Side	Low Channel-5260	Reduced[2]
		Mid Channel-5300	Reduced[2]
		High Channel-5320	Reduced[2]
5.3 GHz 802.11 n20 Antenna 0+1	Top Side	Low Channel-5260	Tested
		Mid Channel-5300	Tested
		High Channel-5320	Tested
	Bottom Side	Low Channel-5260	Reduced[3]
		Mid Channel-5300	Reduced[3]
		High Channel-5320	Reduced[3]
	Left Side	Low Channel-5260	Reduced[7]
		Mid Channel-5300	Reduced[7]
		High Channel-5320	Reduced[7]
	Right Side	Low Channel-5260	Reduced[7]
		Mid Channel-5300	Reduced[7]
		High Channel-5320	Reduced[7]
	Back Side	Low Channel-5260	Reduced[2]
		Mid Channel-5300	Reduced[2]
		High Channel-5320	Reduced[2]

Mode	Side	Channel	Result
5.3 GHz 802.11 ac20 Antenna 0+1	Top Side	Low Channel-5260	Tested
		Mid Channel-5300	Tested
		High Channel-5320	Tested
	Bottom Side	Low Channel-5260	Reduced[3]
		Mid Channel-5300	Reduced[3]
		High Channel-5320	Reduced[3]
	Left Side	Low Channel-5260	Reduced[7]
		Mid Channel-5300	Reduced[7]
		High Channel-5320	Reduced[7]
	Right Side	Low Channel-5260	Reduced[7]
		Mid Channel-5300	Reduced[7]
		High Channel-5320	Reduced[7]
	Back Side	Low Channel-5260	Reduced[2]
		Mid Channel-5300	Reduced[2]
		High Channel-5320	Reduced[2]
5.3 GHz 802.11 n40 (Initial Configuration) Antenna 0+1	Top Side	Low Channel-5270	Tested
		High Channel-5310	Tested
	Bottom Side	Low Channel-5270	Reduced[3]
		High Channel-5310	Reduced[3]
	Left Side	Low Channel-5270	Reduced[7]
		High Channel-5310	Reduced[7]
	Right Side	Low Channel-5270	Reduced[7]
		High Channel-5310	Reduced[7]
	Back Side	Low Channel-5270	Tested
		High Channel-5310	Tested
5.3 GHz 802.11 ac40 Antenna 0+1	Top Side	Low Channel-5270	Tested
		High Channel-5310	Tested
	Bottom Side	Low Channel-5270	Reduced[3]
		High Channel-5310	Reduced[3]
	Left Side	Low Channel-5270	Reduced[7]
		High Channel-5310	Reduced[7]
	Right Side	Low Channel-5270	Reduced[7]
		High Channel-5310	Reduced[7]
	Back Side	Low Channel-5270	Reduced[2]
		High Channel-5310	Reduced[2]
5.3 GHz 802.11 ac80 Antenna 0+1	Top Side	Middle Channel-5290	Tested
	Bottom Side	Middle Channel-5290	Reduced[3]
	Left Side	Middle Channel-5290	Reduced[7]
	Right Side	Middle Channel-5290	Reduced[7]
	Back Side	Middle Channel-5290	Reduced[2]

Mode	Side	Channel	Result
5.6 GHz 802.11 a (Initial Configuration) Antenna 1	Top Side	Low Channel-5500	Tested
		Mid Channel-5580	Tested
		High Channel-5700	Tested
	Bottom Side	Low Channel-5500	Reduced[3]
		Mid Channel-5580	Reduced[3]
		High Channel-5700	Reduced[3]
	Left Side	Low Channel-5500	Reduced[3]
		Mid Channel-5580	Reduced[3]
		High Channel-5700	Reduced[3]
	Right Side	Low Channel-5500	Reduced[7]
		Mid Channel-5580	Reduced[7]
		High Channel-5700	Reduced[7]
	Back Side	Low Channel-5500	Reduced[5]
		Mid Channel-5580	Reduced[5]
		High Channel-5700	Tested
5.6 GHz 802.11 a (Initial Configuration) Antenna 0	Top Side	Low Channel-5500	Reduced[5]
		Mid Channel-5580	Reduced[5]
		High Channel-5700	Tested
	Bottom Side	Low Channel-5500	Reduced[3]
		Mid Channel-5580	Reduced[3]
		High Channel-5700	Reduced[3]
	Left Side	Low Channel-5500	Reduced[7]
		Mid Channel-5580	Reduced[7]
		High Channel-5700	Reduced[7]
	Right Side	Low Channel-5500	Reduced[3]
		Mid Channel-5580	Reduced[3]
		High Channel-5700	Reduced[3]
	Back Side	Low Channel-5500	Reduced[5]
		Mid Channel-5580	Reduced[5]
		High Channel-5700	Tested
5.6 GHz 802.11 n20 Antenna 0+1	Top Side	Low Channel-5500	Tested
		Mid Channel-5580	Tested
		High Channel-5700	Tested
	Bottom Side	Low Channel-5500	Reduced[3]
		Mid Channel-5580	Reduced[3]
		High Channel-5700	Reduced[3]
	Left Side	Low Channel-5500	Reduced[7]
		Mid Channel-5580	Reduced[7]
		High Channel-5700	Reduced[7]
	Right Side	Low Channel-5500	Reduced[7]
		Mid Channel-5580	Reduced[7]
		High Channel-5700	Reduced[7]
	Back Side	Low Channel-5500	Reduced[2]
		Mid Channel-5580	Reduced[2]
		High Channel-5700	Reduced[2]

Mode	Side	Channel	Result
5.6 GHz 802.11 ac20 Antenna 0+1	Top Side	Low Channel-5500	Tested
		Mid Channel-5580	Tested
		High Channel-5700	Tested
	Bottom Side	Low Channel-5500	Reduced[3]
		Mid Channel-5580	Reduced[3]
		High Channel-5700	Reduced[3]
	Left Side	Low Channel-5500	Reduced[7]
		Mid Channel-5580	Reduced[7]
		High Channel-5700	Reduced[7]
	Right Side	Low Channel-5500	Reduced[7]
		Mid Channel-5580	Reduced[7]
		High Channel-5700	Reduced[7]
	Back Side	Low Channel-5500	Reduced[2]
		Mid Channel-5580	Reduced[2]
		High Channel-5700	Reduced[2]
5.6 GHz 802.11 n40 Antenna 0+1	Top Side	Low Channel-5510	Tested
		Mid Channel-5550	Tested
		High Channel-5670	Tested
	Bottom Side	Low Channel-5510	Reduced[3]
		Mid Channel-5550	Reduced[3]
		High Channel-5670	Reduced[3]
	Left Side	Low Channel-5510	Reduced[7]
		Mid Channel-5550	Reduced[7]
		High Channel-5670	Reduced[7]
	Right Side	Low Channel-5510	Reduced[7]
		Mid Channel-5550	Reduced[7]
		High Channel-5670	Reduced[7]
	Back Side	Low Channel-5510	Reduced[2]
		Mid Channel-5550	Reduced[2]
		High Channel-5670	Reduced[2]
5.6 GHz 802.11 ac40 Antenna 0+1	Top Side	Low Channel-5510	Tested
		Mid Channel-5550	Tested
		High Channel-5670	Tested
	Bottom Side	Low Channel-5510	Reduced[3]
		Mid Channel-5550	Reduced[3]
		High Channel-5670	Reduced[3]
	Left Side	Low Channel-5510	Reduced[7]
		Mid Channel-5550	Reduced[7]
		High Channel-5670	Reduced[7]
	Right Side	Low Channel-5510	Reduced[7]
		Mid Channel-5550	Reduced[7]
		High Channel-5670	Reduced[7]
	Back Side	Low Channel-5510	Reduced[2]
		Mid Channel-5550	Reduced[2]
		High Channel-5670	Reduced[2]

Mode	Side	Channel	Result
5.6 GHz 802.11 ac80 Antenna 0+1	Top Side	Low Channel-5530	Tested
		High Channel-5610*	Tested
	Bottom Side	Low Channel-5530	Reduced[3]
		High Channel-5610*	Reduced[3]
	Left Side	Low Channel-5530	Reduced[7]
		High Channel-5610*	Reduced[7]
	Right Side	Low Channel-5530	Reduced[7]
		High Channel-5610*	Reduced[7]
	Back Side	Low Channel-5530	Reduced[2]
		High Channel-5610*	Reduced[2]

Mode	Side	Channel	Result
5.8 GHz 802.11 a Antenna 1	Top Side	Low Channel-5745	Tested
		Mid Channel-5785	Tested
		High Channel-5825	Tested
	Bottom Side	Low Channel-5745	Reduced[3]
		Mid Channel-5785	Reduced[3]
		High Channel-5825	Reduced[3]
	Left Side	Low Channel-5745	Reduced[3]
		Mid Channel-5785	Reduced[3]
		High Channel-5825	Reduced[3]
	Right Side	Low Channel-5745	Reduced[7]
		Mid Channel-5785	Reduced[7]
		High Channel-5825	Reduced[7]
	Back Side	Low Channel-5745	Reduced[2]
		Mid Channel-5785	Reduced[2]
		High Channel-5825	Reduced[2]
5.8 GHz 802.11 a Antenna 0	Top Side	Low Channel-5745	Tested
		Mid Channel-5785	Tested
		High Channel-5825	Tested
	Bottom Side	Low Channel-5745	Reduced[3]
		Mid Channel-5785	Reduced[3]
		High Channel-5825	Reduced[3]
	Left Side	Low Channel-5745	Reduced[7]
		Mid Channel-5785	Reduced[7]
		High Channel-5825	Reduced[7]
	Right Side	Low Channel-5745	Reduced[3]
		Mid Channel-5785	Reduced[3]
		High Channel-5825	Reduced[3]
	Back Side	Low Channel-5745	Reduced[2]
		Mid Channel-5785	Reduced[2]
		High Channel-5825	Reduced[2]
5.8 GHz 802.11 n20 Antenna 0+1	Top Side	Low Channel-5745	Tested
		Mid Channel-5785	Tested
		High Channel-5825	Tested
	Bottom Side	Low Channel-5745	Reduced[3]
		Mid Channel-5785	Reduced[3]
		High Channel-5825	Reduced[3]
	Left Side	Low Channel-5745	Reduced[7]
		Mid Channel-5785	Reduced[7]
		High Channel-5825	Reduced[7]
	Right Side	Low Channel-5745	Reduced[7]
		Mid Channel-5785	Reduced[7]
		High Channel-5825	Reduced[7]
	Back Side	Low Channel-5745	Reduced[2]
		Mid Channel-5785	Reduced[2]
		High Channel-5825	Reduced[2]

*: Channel for FCC only.

Mode	Side	Channel	Result
5.8 GHz 802.11 ac20 Antenna 0+1	Top Side	Low Channel-5745	Tested
		Mid Channel-5785	Tested
		High Channel-5825	Tested
	Bottom Side	Low Channel-5745	Reduced[3]
		Mid Channel-5785	Reduced[3]
		High Channel-5825	Reduced[3]
	Left Side	Low Channel-5745	Reduced[7]
		Mid Channel-5785	Reduced[7]
		High Channel-5825	Reduced[7]
	Right Side	Low Channel-5745	Reduced[7]
		Mid Channel-5785	Reduced[7]
		High Channel-5825	Reduced[7]
	Back Side	Low Channel-5745	Reduced[2]
		Mid Channel-5785	Reduced[2]
		High Channel-5825	Reduced[2]
5.8 GHz 802.11 n40 Antenna 0+1	Top Side	Low Channel-5755	Tested
		High Channel-5795	Tested
	Bottom Side	Low Channel-5755	Reduced[3]
		High Channel-5795	Reduced[3]
	Left Side	Low Channel-5755	Reduced[3]
		High Channel-5795	Reduced[3]
	Right Side	Low Channel-5755	Reduced[3]
		High Channel-5795	Reduced[3]
	Back Side	Low Channel-5755	Tested
		High Channel-5795	Tested
58 GHz 802.11 ac40 Antenna 0+1	Top Side	Low Channel-5755	Tested
		High Channel-5795	Tested
	Bottom Side	Low Channel-5755	Reduced[3]
		High Channel-5795	Reduced[3]
	Left Side	Low Channel-5755	Reduced[7]
		High Channel-5795	Reduced[7]
	Right Side	Low Channel-5755	Reduced[7]
		High Channel-5795	Reduced[7]
	Back Side	Low Channel-5755	Reduced[2]
		High Channel-5795	Reduced[2]
5.8 GHz 802.11 ac80 (Initial Configuration) Antenna 0+1	Top Side	Middle Channel-5775	Tested
	Bottom Side	Middle Channel-5775	Reduced[3]
	Left Side	Middle Channel-5775	Reduced[7]
	Right Side	Middle Channel-5775	Reduced[7]
	Back Side	Middle Channel-5775	Tested

10 SAR Measurement Results

This page summarizes the results of the performed SAR evaluation. The plots with the corresponding SAR distributions, which reveal information about the location of the maximum SAR with respect to the device, could be found in Appendix E.

10.1 Test Environmental Conditions

Temperature:	23° C
Relative Humidity:	43 %
ATM Pressure:	101.89 kPa

Testing was performed by Jin Yang in SAR chamber from 01-03-2016 to 01-10-2016.

10.2 Standalone SAR Results

Please refer to the following tables.

2.4 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
802.11b	Back Side Touch (Middle CH)	2437	Body	Ant 0	16.62	17	1.09	0.824	0.90	1.6	-
	Left Edge Touch (Middle CH)	2437	Body	Ant 0	16.62	17	1.09	0.221	0.24	1.6	-
	Top Side Touch (Middle CH)	2437	Body	Ant 0	16.62	17	1.09	1.01	1.10	1.6	-
	Back Side Touch (High CH)	2452	Body	Ant 0	17.26	17	1.00	1.01	1.01	1.6	-
	Top Side Touch (High CH)	2452	Body	Ant 0	17.26	17	1.00	1.23	**1.23**	1.6	1
	Top Side Touch (Low CH)	2412	Body	Ant 0	16.84	17	1.04	0.923	0.96	1.6	-
	Back Side Touch (Middle CH)	2437	Body	Ant 1	16.11	17	1.23	1.07	1.31	1.6	-
	Right Edge Touch (Middle CH)	2437	Body	Ant 1	16.11	17	1.23	0.0587	0.07	1.6	-
	Top Side Touch (Middle CH)	2437	Body	Ant 1	16.11	17	1.23	0.345	0.42	1.6	-
	Back Side Touch (High CH)	2467	Body	Ant 1	16.04	17	1.25	0.999	1.25	1.6	-
	Back Side Touch (Low CH)	2412	Body	Ant 1	16.84	17	1.04	1.48	**1.54**	1.6	2
802.11g	Back Side Touch (Middle CH)	2437	Body	Ant 1	15.7	16	1.07	1.16	1.24	1.6	-
	Right Edge Touch (Middle CH)	2437	Body	Ant 1	15.7	16	1.07	0.0553	0.06	1.6	-
	Top Side Touch (Middle CH)	2437	Body	Ant 1	15.7	16	1.07	0.314	0.34	1.6	-
	Back Side Touch (High CH)	2457	Body	Ant 1	15.95	16	1.01	1.39	**1.41**	1.6	3
	Back Side Touch (Low CH)	2412	Body	Ant 1	15.55	16	1.11	1.05	1.16	1.6	-

2.4 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
802.11n HT20	Back Side Touch (Middle CH)	2437	Body	Ant 0	16.09	16	1.00	1.17	1.17	1.6	-
	Left Edge Touch (Middle CH)	2437	Body	Ant 0	16.09	16	1.00	0.194	0.19	1.6	-
	Top Side Touch (Middle CH)	2437	Body	Ant 0	16.09	16	1.00	0.925	0.93	1.6	-
	Back Side Touch (High CH)	2457	Body	Ant 0	15.83	16	1.04	1.01	1.05	1.6	-
	Top Side Touch (High CH)	2457	Body	Ant 0	15.83	16	1.04	0.974	1.01	1.6	-
	Back Side Touch (Low CH)	2417	Body	Ant 0	16.25	16	1.00	0.965	0.97	1.6	-
	Top Side Touch (Low CH)	2417	Body	Ant 0	16.25	16	1.00	1.14	1.14	1.6	-
	Back Side Touch (Middle CH)	2437	Body	Ant 1	15.77	16	1.05	1.12	1.18	1.6	-
	Right Edge Touch (Middle CH)	2437	Body	Ant 1	15.77	16	1.05	0.0673	0.07	1.6	-
	Top Side Touch (Middle CH)	2437	Body	Ant 1	15.77	16	1.05	0.118	0.12	1.6	-
	Back Side Touch (High CH)	2457	Body	Ant 1	16.12	16	1.00	1.11	1.11	1.6	-
	Top Side Touch (High CH)	2457	Body	Ant 1	16.12	16	1.00	0.137	0.14	1.6	-
	Back Side Touch (Low CH)	2417	Body	Ant 1	15.7	16	1.07	1.27	**1.36**	1.6	4
	Top Side Touch (Low CH)	2417	Body	Ant 1	15.7	16	1.07	0.149	0.16	1.6	-

2.4 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
Bluetooth - GFSK	Back Side Touch (Middle CH)	2441	Body	Ant 0	10.74	10.5	1.00	0.151	0.151	1.6	-
	Top Side Touch (Middle CH)	2441	Body	Ant 0	10.74	10.5	1.00	0.159	**0.159**	1.6	5
	Back Side Touch (Low CH)	2402	Body	Ant 0	7.66	7.5	1.00	0.0903	0.0903	1.6	-
	Top Side Touch (Low CH)	2402	Body	Ant 0	7.66	7.5	1.00	0.0916	0.0916	1.6	-
	Back Side Touch (High CH)	2480	Body	Ant 0	7.66	7.5	1.00	0.152	0.152	1.6	-
	Top Side Touch (High CH)	2480	Body	Ant 0	10	10	1.00	0.118	0.118	1.6	-
BLE	Back Side Touch (Middle CH)	2440	Body	Ant 0	Flat	6.57	6.5	1.00	0.0384	0.0384	1.6
	Top Side Touch (Middle CH)	2440	Body	Ant 0	Flat	6.57	6.5	1.00	0.0381	0.0381	1.6
	Back Side Touch (Low CH)	2402	Body	Ant 0	Flat	4.12	4	1.00	0.0292	0.0292	1.6
	Top Side Touch (Low CH)	2402	Body	Ant 0	Flat	4.12	4	1.00	0.0245	0.0245	1.6
	Back Side Touch (High CH)	2480	Body	Ant 0	Flat	5.99	6	1.00	0.0271	0.0271	1.6
	Top Side Touch (High CH)	2480	Body	Ant 0	Flat	5.99	6	1.00	0.0306	0.0306	1.6

5.2 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
802.11a	Top Side Touch (Middle CH)	5220	Body	Ant 1	10.89	11	1.03	1.39	**1.43**	1.6	6
	Top Side Touch (High CH)	5240	Body	Ant 1	10.92	11	1.02	1.39	1.42	1.6	-
	Top Side Touch (Low CH))	5180	Body	Ant 1	10.9	11	1.02	1.37	1.40	1.6	-
802.11n HT20	Top Side Touch (Low CH)	5180	Body	Ant 0	10.24	11	1.19	0.335	0.40	1.6	-
	Top Side Touch (Middle CH)	5220	Body	Ant 0	11.03	11	1.00	0.402	0.40	1.6	-
	Top Side Touch (High CH)	5240	Body	Ant 0	10.98	11	1.00	0.288	0.29	1.6	-
	Top Side Touch (Low CH)	5180	Body	Ant 1	10.9	11	1.02	1.38	**1.41**	1.6	7
	Top Side Touch (Middle CH)	5220	Body	Ant 1	10.91	11	1.02	1.29	1.32	1.6	-
	Top Side Touch (High CH)	5240	Body	Ant 1	10.84	10.5	1.00	1.25	1.25	1.6	-
802.11 ac20	Top Side Touch (Low CH)	5180	Body	Ant 0	10.32	11	1.17	0.332	0.39	1.6	-
	Top Side Touch (Middle CH)	5220	Body	Ant 0	10.86	11	1.03	0.37	0.38	1.6	-
	Top Side Touch (High CH)	5240	Body	Ant 0	10.86	11	1.03	0.317	0.33	1.6	-
	Top Side Touch (Low CH)	5180	Body	Ant 1	10.92	11	1.02	1.36	1.39	1.6	-
	Top Side Touch (Middle CH)	5220	Body	Ant 1	10.96	11	1.01	1.25	1.26	1.6	-
	Top Side Touch (High CH)	5240	Body	Ant 1	10.45	10	1.00	1.42	**1.42**	1.6	8

5.2 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
802.11n HT40	Top Side Touch (Low CH)	5190	Body	Ant 0	10.29	10.5	1.05	0.365	0.38	1.6	-
	Top Side Touch (High CH)	5230	Body	Ant 0	11.04	11	1.00	0.371	0.37	1.6	-
	Top Side Touch (Low CH)	5190	Body	Ant 1	10.85	10.5	1.00	1.45	**1.45**	1.6	9
	Top Side Touch (High CH)	5230	Body	Ant 1	10.96	11	1.01	1.4	1.41	1.6	-
802.11 ac40	Top Side Touch (Low CH)	5190	Body	Ant 0	10.34	11	1.16	0.396	0.46	1.6	-
	Top Side Touch (High CH)	5230	Body	Ant 0	11	11	1.00	0.346	0.35	1.6	-
	Top Side Touch (Low CH)	5190	Body	Ant 1	10.96	11	1.01	1.41	**1.42**	1.6	10
	Top Side Touch (High CH)	5230	Body	Ant 1	11.02	11	1.00	1.4	1.40	1.6	-
802.11 ac80	Top Side Touch (Middle CH)	5210	Body	Ant 0	10.6	11	1.10	0.341	0.37	1.6	-
	Back Side Touch (Middle CH)	5210	Body	Ant 0	10.6	11	1.10	0.573	0.63	1.6	-
	Top Side Touch (Middle CH)	5210	Body	Ant 1	10.71	11	1.07	1.34	**1.43**	1.6	11
	Back Side Touch (Middle CH)	5210	Body	Ant 1	10.71	11	1.07	0.817	0.87	1.6	-

5.3 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
802.11a	Top Side Touch (Middle CH)	5300	Body	Ant 0	12.29	12.5	1.05	0.363	0.38	1.6	-
	Top Side Touch (Low CH)	5260	Body	Ant 1	10.61	10.5	1.00	1.35	1.35	1.6	-
	Top Side Touch (Middle CH)	5300	Body	Ant 1	10.79	11	1.05	1.3	1.36	1.6	-
	Top Side Touch (High CH)	5320	Body	Ant 1	10.8	11	1.05	1.35	**1.41**	1.6	12
802.11n HT20	Top Side Touch (Low CH)	5260	Body	Ant 0	11.53	11.5	1.00	0.336	0.34	1.6	-
	Top Side Touch (Middle CH)	5300	Body	Ant 0	12.37	12.5	1.03	0.363	0.37	1.6	-
	Top Side Touch (High CH)	5320	Body	Ant 0	12.32	12.5	1.04	0.399	0.42	1.6	-
	Top Side Touch (Low CH)	5260	Body	Ant 1	10.29	10.5	1.05	1.36	**1.43**	1.6	13
	Top Side Touch (Middle CH)	5300	Body	Ant 1	10.65	10.5	1.00	1.34	1.34	1.6	-
	Top Side Touch (High CH)	5320	Body	Ant 1	10.96	11	1.01	1.35	1.36	1.6	-
802.11 ac20	Top Side Touch (Low CH)	5260	Body	Ant 0	11.51	11.5	1.00	0.319	0.32	1.6	-
	Top Side Touch (Middle CH)	5300	Body	Ant 0	12.39	12.5	1.03	0.384	0.39	1.6	-
	Top Side Touch (High CH)	5320	Body	Ant 0	12.39	12.5	1.03	0.423	0.43	1.6	-
	Top Side Touch (Low CH)	5260	Body	Ant 1	10.4	10.5	1.02	1.35	**1.38**	1.6	14
	Top Side Touch (Middle CH)	5300	Body	Ant 1	10.92	10.5	1.00	1.33	1.33	1.6	-
	Top Side Touch (High CH)	5320	Body	Ant 1	11.02	11	1.00	1.36	1.36	1.6	-

5.3 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
802.11n HT40	Top Side Touch (Low CH)	5270	Body	Ant 0	12.01	12	1.00	0.377	0.38	1.6	-
	Back Side Touch (Low CH)	5270	Body	Ant 0	12.01	12	1.00	0.694	0.69	1.6	-
	Top Side Touch (High CH)	5310	Body	Ant 0	12.75	12.5	1.00	0.347	0.35	1.6	-
	Back Side Touch (High CH)	5310	Body	Ant 0	12.75	12.5	1.00	0.798	0.80	1.6	-
	Top Side Touch (Low CH)	5270	Body	Ant 1	11.01	11	1.00	1.37	1.37	1.6	-
	Back Side Touch (Low CH)	5270	Body	Ant 1	11.01	11	1.00	1.03	1.03	1.6	-
	Top Side Touch (High CH)	5310	Body	Ant 1	10.86	11	1.03	1.4	**1.45**	1.6	15
	Back Side Touch (High CH)	5310	Body	Ant 1	10.86	11	1.03	1	1.03	1.6	-
802.11 ac40	Top Side Touch (Low CH)	5270	Body	Ant 0	12.08	12	1.00	0.396	0.40	1.6	-
	Top Side Touch (High CH)	5310	Body	Ant 0	12.66	12.5	1.00	0.393	0.39	1.6	-
	Top Side Touch (Low CH)	5270	Body	Ant 1	10.82	11	1.04	1.38	**1.44**	1.6	16
	Top Side Touch (High CH)	5310	Body	Ant 1	11.2	11	1.00	1.35	1.35	1.6	-
802.11 ac80	Top Side Touch (Middle CH)	5290	Body	Ant 0	12.2	12	1.00	0.333	0.33	1.6	-
	Top Side Touch (Middle CH)	5290	Body	Ant 1	10.64	10.5	1.00	1.29	**1.29**	1.6	17

5.6 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
802.11 a	Top Side Touch (High CH)	5700	Body	Ant 0	12.87	13	1.03	0.517	0.53	1.6	-
	Back Side Touch (High CH)	5700	Body	Ant 0	12.87	13	1.03	0.591	0.61	1.6	-
	Top Side Touch (High CH)	5700	Body	Ant 1	11.26	11	1.00	1.37	1.37	1.6	-
	Back Side Touch (High CH)	5700	Body	Ant 1	11.26	11	1.00	0.751	0.751	1.6	-
	Top Side Touch (Middle CH)	5580	Body	Ant 1	9.55	9.5	1.00	1.43	**1.43**	1.6	18
	Top Side Touch (Low CH)	5500	Body	Ant 1	10.21	10	1.00	1.29	1.29	1.6	-
802.11n HT20	Top Side Touch (Low CH)	5500	Body	Ant 0	9.83	10.5	1.17	0.223	0.26	1.6	-
	Top Side Touch (Middle CH)	5580	Body	Ant 0	9.45	9.5	1.01	0.258	0.26	1.6	-
	Top Side Touch (High CH)	5700	Body	Ant 0	12.76	12.5	1.00	0.513	0.51	1.6	-
	Top Side Touch (Low CH)	5500	Body	Ant 1	10.36	10.5	1.03	1.32	1.36	1.6	-
	Top Side Touch (Middle CH)	5580	Body	Ant 1	9.4	9.5	1.02	1.29	1.32	1.6	-
	Top Side Touch (High CH)	5700	Body	Ant 1	11.14	11	1.00	1.38	**1.38**	1.6	19
802.11 ac20	Top Side Touch (Low CH)	5500	Body	Ant 0	9.79	10.5	1.18	0.317	0.37	1.6	-
	Top Side Touch (Middle CH)	5580	Body	Ant 0	9.32	9.5	1.04	0.282	0.29	1.6	-
	Top Side Touch (High CH)	5700	Body	Ant 0	12.7	12.5	1.00	0.512	0.51	1.6	-
	Top Side Touch (Low CH)	5500	Body	Ant 1	10.31	10.5	1.04	1.35	**1.41**	1.6	20
	Top Side Touch (Middle CH)	5580	Body	Ant 1	9.5	9.5	1.00	1.28	1.28	1.6	-
	Top Side Touch (High CH)	5700	Body	Ant 1	11.22	11	1.00	1.32	1.32	1.6	-

5.6 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
802.11n HT40	Top Side Touch (Low CH)	5510	Body	Ant 0	10.01	10.5	1.12	0.233	0.26	1.6	-
	Top Side Touch (Middle CH)	5550	Body	Ant 0	9.3	10	1.17	0.215	0.25	1.6	-
	Top Side Touch (High CH)	5670	Body	Ant 0	10.4	10.5	1.02	0.287	0.29	1.6	-
	Top Side Touch (Low CH)	5510	Body	Ant 1	10.68	10.5	1.00	1.4	1.40	1.6	-
	Top Side Touch (Middle CH)	5550	Body	Ant 1	10	10	1.00	1.42	**1.42**	1.6	21
	Top Side Touch (High CH)	5670	Body	Ant 1	9.2	10	1.20	1.06	1.27	1.6	-
802.11 ac40	Top Side Touch (Low CH)	5510	Body	Ant 0	10.06	10.5	1.11	0.22	0.24	1.6	-
	Top Side Touch (Middle CH)	5550	Body	Ant 0	9.43	10	1.14	0.21	0.24	1.6	-
	Top Side Touch (High CH)	5670	Body	Ant 0	10.45	10.5	1.01	0.298	0.30	1.6	-
	Top Side Touch (Low CH)	5510	Body	Ant 1	10.6	10.5	1.00	1.44	**1.44**	1.6	22
	Top Side Touch (Middle CH)	5550	Body	Ant 1	10.22	10	1.00	1.42	1.42	1.6	-
	Top Side Touch (High CH)	5670	Body	Ant 1	9.2	10	1.20	1.01	1.21	1.6	-
802.11 ac80	Top Side Touch (Low CH)	5530	Body	Ant 0	9.27	10	1.18	0.224	0.27	1.6	-
	Top Side Touch (High CH)	5610	Body	Ant 0	9.91	10	1.02	0.159	0.16	1.6	-
	Top Side Touch (Low CH)	5530	Body	Ant 1	10.01	10	1.00	1.44	**1.44**	1.6	23
	Top Side Touch (Middle CH)	5610	Body	Ant 1	9.41	10	1.15	1.17	1.34	1.6	-

5.8 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
802.11 a	Top Side Touch (Low CH)	5745	Body	Ant 0	13.5	13.5	1.00	1.11	1.11	1.6	-
	Top Side Touch (Middle CH)	5785	Body	Ant 0	12.94	13	1.01	1.41	**1.43**	1.6	24
	Top Side Touch (High CH)	5825	Body	Ant 0	11.66	12	1.08	1.29	1.40	1.6	-
	Top Side Touch (Low CH)	5745	Body	Ant 1	11.67	12	1.08	1.23	1.33	1.6	-
	Top Side Touch (Middle CH)	5785	Body	Ant 1	12.01	12.5	1.12	1.21	1.35	1.6	-
	Top Side Touch (High CH)	5825	Body	Ant 1	12.83	12.5	1.00	1.1	1.10	1.6	-
802.11n HT20	Top Side Touch (Low CH)	5745	Body	Ant 0	13.5	13.5	1.00	0.797	0.80	1.6	-
	Top Side Touch (Middle CH)	5785	Body	Ant 0	13.08	13	1.00	1.05	1.05	1.6	-
	Top Side Touch (High CH)	5825	Body	Ant 0	11.58	12	1.10	1.02	1.12	1.6	-
	Top Side Touch (Low CH)	5745	Body	Ant 1	11.83	12	1.04	1.33	1.38	1.6	-
	Top Side Touch (Middle CH)	5785	Body	Ant 1	12.08	12.5	1.10	1.25	**1.38**	1.6	25
	Top Side Touch (High CH)	5825	Body	Ant 1	11.43	12	1.14	1.04	1.19	1.6	-
802.11 ac20	Top Side Touch (Low CH)	5745	Body	Ant 0	13.46	13.5	1.01	0.739	0.75	1.6	-
	Top Side Touch (Middle CH)	5785	Body	Ant 0	13.06	13	1.00	0.986	0.99	1.6	-
	Top Side Touch (High CH)	5825	Body	Ant 0	11.45	12	1.14	0.992	1.13	1.6	-
	Top Side Touch (Low CH)	5745	Body	Ant 1	11.9	12	1.02	1.37	**1.40**	1.6	26
	Top Side Touch (Middle CH)	5785	Body	Ant 1	12.16	12.5	1.08	1.23	1.33	1.6	-
	Top Side Touch (High CH)	5825	Body	Ant 1	11.4	12	1.15	0.903	1.04	1.6	-

5.8 GHz Band											
Radio Mode	EUT Position	Freq. (MHz)	Test Type	Ant. Chain	Output Power (dBm)		Scale Factor	Measured SAR (W/kg)	Scaled SAR (W/kg)	Limit (W/kg) 1g Tissue	Plot #
					Measured	Target					
802.11n HT40	Top Side Touch (Low CH)	5755	Body	Ant 0	13.5	13.5	1.00	0.949	0.95	1.6	-
	Back Side Touch (Low CH)	5755	Body	Ant 0	13.5	13.5	1.00	1.01	1.01	1.6	-
	Top Side Touch (High CH)	5795	Body	Ant 0	12.03	12	1.00	0.893	0.89	1.6	-
	Back Side Touch (High CH)	5795	Body	Ant 0	12.03	12	1.00	0.887	0.89	1.6	-
	Top Side Touch (Low CH)	5755	Body	Ant 1	12.14	12.5	1.09	1.3	**1.41**	1.6	27
	Back Side Touch (Low CH)	5755	Body	Ant 1	12.14	12.5	1.09	0.851	0.92	1.6	-
	Top Side Touch (High CH)	5795	Body	Ant 1	11.65	12	1.08	1.13	1.22	1.6	-
	Back Side Touch (High CH)	5795	Body	Ant 1	11.65	12	1.08	0.667	0.72	1.6	-
802.11 ac40	Top Side Touch (Low CH)	5755	Body	Ant 0	13.5	13.5	1.00	0.859	0.86	1.6	-
	Top Side Touch (High CH)	5795	Body	Ant 0	12.05	12	1.00	0.92	0.92	1.6	-
	Top Side Touch (Low CH)	5755	Body	Ant 1	12.32	12.5	1.04	1.38	**1.44**	1.6	28
	Top Side Touch (High CH)	5795	Body	Ant 1	11.34	12	1.16	1.14	1.33	1.6	-
802.11 ac80	Top Side Touch (Middle CH)	5775	Body	Ant 0	13.1	13	1.00	1.11	1.11	1.6	-
	Back Side Touch (Middle CH)	5775	Body	Ant 0	13.1	13	1.00	0.848	0.85	1.6	-
	Top Side Touch (Middle CH)	5775	Body	Ant 1	12.08	12.5	1.10	1.23	**1.35**	1.6	29
	Back Side Touch (Middle CH)	5775	Body	Ant 1	12.08	12.5	1.10	0.819	0.90	1.6	-

Corrected SAR Evaluation Table

Frequency (MHz)	Liquid Type	C_ε	$\triangle\varepsilon_r$	C_δ	$\triangle_\delta$	△SAR
2412	Body	-0.225	0.013	0.489	0.016	0.005
2437	Body	-0.225	0.011	0.483	0.005	0.000
2462	Body	-0.225	0.008	0.478	0.020	0.008
5180	Body	-0.202	-0.024	-0.024	-0.047	0.006
5220	Body	-0.201	-0.024	-0.027	-0.043	0.006
5240	Body	-0.201	-0.025	-0.028	-0.047	0.006
5260	Body	-0.201	-0.026	-0.030	-0.047	0.007
5300	Body	-0.201	-0.029	-0.032	-0.042	0.007
5320	Body	-0.201	-0.029	-0.034	-0.044	0.007
5500	Body	-0.200	-0.034	-0.042	-0.028	0.008
5580	Body	-0.199	-0.039	-0.044	-0.030	0.009
5700	Body	-0.199	-0.038	-0.046	-0.019	0.008
5745	Body	-0.199	-0.039	-0.045	-0.020	0.009
5785	Body	-0.199	-0.041	-0.045	-0.013	0.009
5825	Body	-0.199	-0.042	-0.044	-0.017	0.009

$$\Delta SAR = c_\varepsilon \, \Delta\varepsilon_r + c_\sigma \, \Delta\sigma$$

$$c_\varepsilon = -7{,}854 \times 10^{-4} f^3 + 9{,}402 \times 10^{-3} f^2 - 2{,}742 \times 10^{-2} f - 0{,}202\,6$$

$$c_\sigma = 9{,}804 \times 10^{-3} f^3 - 8{,}661 \times 10^{-2} f^2 + 2{,}981 \times 10^{-2} f + 0{,}782\,9$$

where

f is the frequency in GHz.

Note 1: According NOTICE 2012-DRS0529, if the correction △SAR has a negative sign, the measured SAR result should be corrected, and has a positive sign, the measured SAR result shall not be corrected.

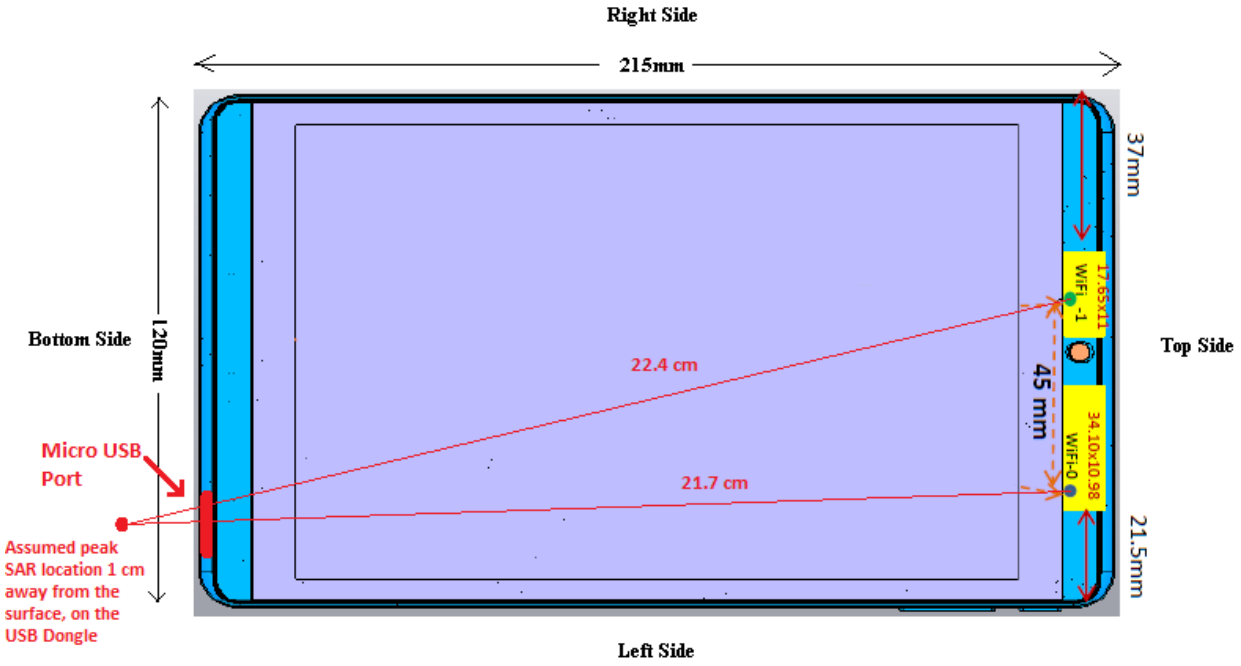
Note 2: NOTICE 2012-DRS1203: Based on the IEEE 1528 and IEC 62209 requirements, the high, mid and low channels for the configuration with the highest SAR value must be tested regardless of the SAR value measured.

10.3 Multi-TX and Antenna SAR Considerations

The NVIDIA Tablet (Model: P2290W) contains at most two radio modules inside, namely Bluetooth and WLAN radios, each internal radio has individual registration identifiers.

EUT Antennas Location

(Front Side View)



***Note1**: Simultaneous Transmit:*

The possible Simultaneous Transmit:
Bluetooth and 5 GHz WLAN

When the Sum SAR value over 1.6W/KG, based on KDB447498 D01v05, SPLSR=(SAR1+SAR2)^(1.5)/(min. separation distance, mm) ≦0.04, and the peak separation distance is computed by the square root of [(x1-x2)²+ (y1-y2) ² + (z1-z2) ²], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the area scans or extrapolated peak SAR locations in the zoom scans.*

If SPLSR ≦0.04, simultaneously transmission SAR measurement is not necessary

10.3.1 Estimated SAR

According to FCC KDB 447498 Section 4.3.2 b), when an antenna qualifies for the standalone SAR test exclusion of 4.3.1 and also transmits simultaneously with other antennas, the standalone SAR value must be estimated according to the following to determine the simultaneous transmission SAR test exclusion criteria:

1) [(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [$\sqrt{f_{(GHz)}}$/x] W/kg, for test separation distance ≤ 50 mm;

Where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR

2) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distance is > 50 mm.

5.2 GHz							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Estimated SAR (W/kg)**
802.11a	0	Back	5220	12.19	16.56	5	1.01
		Top	5220	12.19	16.56	5	1.01
		Left	5220	12.19	16.56	21.5	0.23
		Right	-	-	-	65.4	0.40
	1	Back	5240	11	12.59	5	0.77
		Left	-	-	-	66.35	0.40
		Right	5240	11	12.59	37	0.10
802.11n20	0	Back	5220	11.03	12.68	5	0.77
		Left	5220	11.03	12.68	21.5	0.18
		Right	-	-	-	65.4	0.40
	1	Back	5220	11	12.59	5	0.77
		Left	-	-	-	66.35	0.40
		Right	5220	11	12.59	37	0.10
802.11ac20	0	Back	5240	11	12.59	5	0.77
		Left	5240	11	12.59	21.5	0.18
		Right	-	-	-	65.4	0.40
	1	Back	5220	11	12.59	5	0.77
		Left	-	-	-	66.35	0.40
		Right	5220	11	12.59	37	0.10
802.11n40	0	Back	5230	11.04	12.71	5	0.77
		Left	5230	11.04	12.71	21.5	0.18
		Right	-	-	-	65.4	0.40
	1	Back	5230	11	12.59	5	0.77
		Left	-	-	-	66.35	0.40
		Right	5230	11	12.59	37	0.10
802.11ac40	0	Back	5230	11	12.59	5	0.77
		Left	5230	11	12.59	21.5	0.18
		Right	-	-	-	65.4	0.40
	1	Back	5230	11.02	12.65	5	0.77
		Left	-	-	-	66.35	0.40
		Right	5230	11.02	12.65	37	0.10
8002.11ac80	0	Left	5210	11	12.59	21.5	0.18
		Right	-	-	-	65.4	0.40
	1	Left	-	-	-	66.35	0.40
		Right	5210	11	12.59	37	0.10

5.3 GHz							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Estimated SAR (W/kg)**
802.11a	0	Back	5320	12.5	17.78	5	1.09
		Left	5320	12.5	17.78	21.5	0.25
		Right	-	-	-	65.4	0.4
	1	Back	5320	11	12.59	5	0.77
		Left	-	-	-	66.35	0.4
		Right	5320	11	12.59	37	0.10
q802.11n20	0	Back	5320	12.5	17.78	5	1.09
		Left	5320	12.5	17.78	21.5	0.25
		Right	-	-	-	65.4	0.4
	1	Back	5320	11	12.59	5	0.77
		Left	-	-	-	66.35	0.4
		Right	5320	11	12.59	37	0.10
802.11ac20	0	Back	5320	12.5	17.78	5	1.09
		Left	5320	12.5	17.78	21.5	0.25
		Right	-	-	-	65.4	0.4
	1	Back	5320	11.02	12.65	5	0.78
		Left	-	-	-	66.35	0.4
		Right	5320	11.02	12.65	37	0.11
802.11n40	0	Left	5310	12.75	18.84	21.5	0.27
		Right	-	-	-	65.4	0.4
	1	Left	-	-	-	66.35	0.4
		Right	5270	11.01	12.62	37	0.10
802.11ac40	0	Back	5310	12.66	18.45	5	1.13
		Left	5310	12.66	18.45	21.5	0.26
		Right	-	-	-	65.4	0.4
	1	Back	5310	11.2	13.18	5	0.81
		Left	-	-	-	66.35	0.4
		Right	5310	11.2	13.18	37	0.11
802.11ac80	0	Back	5290	12.2	16.60	5	1.02
		Left	5290	12.2	16.60	21.5	0.24
		Right	-	-	-	65.4	0.4
	1	Back	5290	10.64	11.59	5	0.71
		Left	-	-	-	66.35	0.4
		Right	5290	10.64	11.59	37	0.10

5.6 GHz							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Estimated SAR (W/kg)**
802.11a	0	Left	5700	13	19.95	21.5	0.30
		Right	-	-	-	65.4	0.4
	1	Left	-	-	-	66.35	0.4
		Right	5700	11.26	13.37	37	0.11
802.11n20	0	Back	5700	12.76	18.88	5	1.20
		Left	5700	12.76	18.88	21.5	0.28
		Right	-	-	-	65.4	0.4
	1	Back	5700	11.14	13.00	5	0.83
		Left	-	-	-	66.35	0.4
		Right	5700	11.14	13.00	37	0.11
802.11ac20	0	Back	5700	12.7	18.62	5	1.19
		Left	5700	12.7	18.62	21.5	0.28
		Right	-	-	-	65.4	0.4
	1	Back	5700	11.22	13.24	5	0.84
		Left	-	-	-	66.35	0.4
		Right	5700	11.22	13.24	37	0.11
802.11n40	0	Back	5670	10.5	11.22	5	0.71
		Left	5670	10.5	11.22	21.5	0.17
		Right	-	-	-	65.4	0.4
	1	Back	5510	10.68	11.69	5	0.73
		Left	-	-	-	66.35	0.4
		Right	5510	10.68	11.69	37	0.10
802.11ac40	0	Back	5670	10.5	11.22	5	0.71
		Left	5670	10.5	11.22	21.5	0.17
		Right	-	-	-	65.4	0.4
	1	Back	5510	10.6	11.48	5	0.72
		Left	-	-	-	66.35	0.4
		Right	5510	10.6	11.48	37	0.10
802.11ac80	0	Back	5610	10	10.00	5	0.63
		Left	5610	10	10.00	21.5	0.15
		Right	-	-	-	65.4	0.4
	1	Back	5530	10.1	10.23	5	0.64
		Left	-	-	-	66.35	0.4
		Right	5530	10.1	10.23	37	0.09

5.8 GHz							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Estimated SAR (W/kg)**
802.11a	0	Back	5745	13.5	22.39	5	1.43
		Left	5745	13.5	22.39	21.5	0.33
		Right	-	-	-	65.4	0.4
	1	Back	5825	12.83	19.19	5	1.23
		Left	-	-	-	66.35	0.4
		Right	5825	12.83	19.19	37	0.17
802.11n20	0	Back	5745	13.5	22.39	5	1.43
		Left	5745	13.5	22.39	21.5	0.33
		Right	-	-	-	65.4	0.4
	1	Back	5785	12.5	17.78	5	1.14
		Left	-	-	-	66.35	0.4
		Right	5785	12.5	17.78	37	0.15
802.11ac20	0	Back	5745	13.5	22.39	5	1.43
		Left	5745	13.5	22.39	21.5	0.33
		Right	-	-	-	65.4	0.4
	1	Back	5785	12.5	17.78	5	1.14
		Left	-	-	-	66.35	0.4
		Right	5785	12.5	17.78	37	0.15
802.11n40	0	Left	5755	13.5	22.39	21.5	0.33
		Right	-	-	-	65.4	0.4
	1	Left	-	-	-	66.35	0.4
		Right	5755	12.5	17.78	37	0.15
802.11ac40	0	Back	5755	13.5	22.39	5	1.43
		Left	5755	13.5	22.39	21.5	0.33
		Right	-	-	-	65.4	0.4
	1	Back	5755	12.5	17.78	5	1.14
		Left	-	-	-	66.35	0.4
		Right	5755	12.5	17.78	37	0.15
802.11ac80	0	Left	5775	13.1	20.42	21.5	0.30
		Right	-	-	-	65.4	0.4
	1	Left	-	-	-	66.35	0.4
		Right	5775	12.5	17.78	37	0.15

BT/BLE							
Mode	**Antenna**	**Position**	**Frequency (MHz)**	**Max. Power (dBm)**	**Max. Power (mW)**	**Separation distance from body (mm)**	**Estimated SAR (W/kg)**
BT/BLE	0	Left	2441	10.74	11.86	21.5	0.11
		Right	-	-	-	65.4	0.40

10.3.2 Simultaneous Transmission Analysis

Position	SAR (W/kg)									Ri (mm)	SPLS Ratio
	5.2G Wifi 802.11a Ant0	5.2G Wifi 802.11a Ant1	5.2G Wifi 802.11 n20	5.2G Wifi 802.11 ac20	5.2G Wifi 802.11 n40	5.2G Wifi 802.11 ac40	5.2G Wifi 802.11 ac80	2.4GHz BT/ BLE	Sum of SAR		
Back Touch	1.01	-	-	-	-		-	0.152	1.169	-	-
	-	0.77	-	-	-		-	0.152	0.922	-	-
	-	-	0.77	-	-		-	0.152	0.922	-	-
	-	-	-	0.77	-		-	0.152	0.922	-	-
	-	-	-	-	0.77	-	-	0.152	0.922	-	-
	-	-	-	-	-	0.77	-	0.152	0.922	-	-
	-	-	-	-	-	-	0.87	0.152	1.025	-	-
Top Touch	1.01	-	-	-	-		-	0.159	1.169	-	-
	-	1.43	-	-	-		-	0.159	1.585	-	-
	-	-	1.41	-	-		-	0.159	1.571	-	
	-	-	-	1.42	-		-	0.159	1.579	-	-
	-	-	-	-	1.45	-	-	0.159	**1.609**	47.21	0.04
	-	-	-	-	-	1.42	-	0.159	1.582	-	-
	-	-	-	-	-	-	1.43	0.159	1.592	-	-
Left Touch	0.23	-	-	-	-	-	-	0.11	0.34	-	-
	-	0.4	-	-	-	-	-	0.11	0.51	-	-
	-	-	0.4	-	-	-	-	0.11	0.51	-	-
	-	-	-	0.4	-	-	-	0.11	0.51	-	-
	-	-	-	-	0.4	-	-	0.11	0.51	-	-
	-	-	-	-	-	0.4	-	0.11	0.51	-	-
	-	-	-	-	-	-	0.4	0.11	0.51	-	-
Right Touch	0.4	-	-	-	-	-	-	0.4	0.8	-	-
	-	0.1	-	-	-	-	-	0.4	0.5	-	-
	-	-	0.4	-	-	-	-	0.4	0.8	-	-
	-	-	-	0.4	-	-	-	0.4	0.8	-	-
	-	-	-	-	0.4	-	-	0.4	0.8	-	-
	-	-	-	-	-	0.4	-	0.4	0.8	-	-
	-	-	-	-	-	-	0.4	0.4	0.8	-	-

Position	SAR (W/kg)									Ri (mm)	SPLS Ratio
	5.3G Wifi 802.11a Ant0	5.3G Wifi 802.11a Ant1	5.3G Wifi 802.11 n20	5.3G Wifi 802.11 ac20	5.3G Wifi 802.11 n40	5.3G Wifi 802.11 ac40	5.3G Wifi 802.11 ac80	2.4GHz BT/ BLE	Sum of SAR		
Back Touch	1.09	-	-	-	-		-	0.152	1.242	-	-
	-	0.77	-	-	-		-	0.152	0.922	-	-
	-	-	1.09	-	-		-	0.152	1.242	-	-
	-	-	-	1.09	-		-	0.152	1.242	-	-
	-	-	-	-	1.03	-	-	0.152	1.180	-	-
	-	-	-	-	-	1.13	-	0.152	1.282	-	-
	-	-	-	-	-	-	1.02	0.152	1.172	-	-
Top Touch	0.38	-	-	-	-		-	0.159	0.540	-	-
	-	1.41	-	-	-		-	0.159	1.573	-	-
	-	-	1.43	-	-		-	0.159	1.586	-	
	-	-	-	1.38	-		-	0.159	1.540	-	-
	-	-	-	-	1.45	-	-	0.159	1.605	47.05	0.04
	-	-	-	-	-	1.44	-	0.159	1.597	-	-
	-	-	-	-	-	-	1.29	0.159	1.449	-	-
Left Touch	0.25	-	-	-	-	-	-	0.11	0.36	-	-
	-	0.4	-	-	-	-	-	0.11	0.51	-	-
	-	-	0.4	-	-	-	-	0.11	0.51	-	-
	-	-	-	0.4	-	-	-	0.11	0.51	-	-
	-	-	-	-	0.4	-	-	0.11	0.51	-	-
	-	-	-	-	-	0.4	-	0.11	0.51	-	-
	-	-	-	-	-	-	0.4	0.11	0.51	-	-
Right Touch	0.4	-	-	-	-	-	-	0.4	0.8	-	-
	-	0.1	-	-	-	-	-	0.4	0.5	-	-
	-	-	0.4	-	-	-	-	0.4	0.8	-	-
	-	-	-	0.4	-	-	-	0.4	0.8	-	-
	-	-	-	-	0.4	-	-	0.4	0.8	-	-
	-	-	-	-	-	0.4	-	0.4	0.8	-	-
	-	-	-	-	-	-	0.4	0.4	0.8	-	-

Position	SAR (W/kg)									Ri (mm)	SPLS Ratio
	5.6G Wifi 802.11a Ant0	5.6G Wifi 802.11a Ant1	5.6G Wifi 802.11 n20	5.6G Wifi 802.11 ac20	5.6G Wifi 802.11 n40	5.6G Wifi 802.11 ac40	5.6G Wifi 802.11 ac80	2.4GHz BT/ BLE	Sum of SAR		
Back Touch	0.61	-	-	-	-	-	-	0.152	0.761	-	-
	-	0.75	-	-	-	-	-	0.152	0.903	-	-
	-	-	1.20	-	-	-	-	0.152	1.352	-	-
	-	-	-	1.19	-	-	-	0.152	1.342	-	-
	-	-	-	-	0.73	-	-	0.152	0.882	-	-
	-	-	-	-	-	0.72	-	0.152	0.881	-	-
	-	-	-	-	-	-	0.64	0.152	0.792	-	-
Top Touch	0.53	-	-	-	-	-	-	0.159	0.692	-	-
	-	1.43	-	-	-	-	-	0.159	1.589	-	-
	-	-	1.38	-	-	-	-	0.159	1.539	-	-
	-	-	-	1.41	-	-	-	0.159	1.569	-	-
	-	-	-	-	1.42	-	-	0.159	1.579	-	-
	-	-	-	-	-	1.44	-	0.159	1.599	-	-
	-	-	-	-	-	-	1.44	0.159	1.599	-	-
Left Touch	0.3	-	-	-	-	-	-	0.11	0.41	-	-
	-	0.4	-	-	-	-	-	0.11	0.51	-	-
	-	-	0.4	-	-	-	-	0.11	0.51	-	-
	-	-	-	0.4	-	-	-	0.11	0.51	-	-
	-	-	-	-	0.4	-	-	0.11	0.51	-	-
	-	-	-	-	-	0.4	-	0.11	0.51	-	-
	-	-	-	-	-	-	0.4	0.11	0.51	-	-
Right Touch	0.4	-	-	-	-	-	-	0.4	0.8	-	-
	-	0.11	-	-	-	-	-	0.4	0.51	-	-
	-	-	0.4	-	-	-	-	0.4	0.8	-	-
	-	-	-	0.4	-	-	-	0.4	0.8	-	-
	-	-	-	-	0.4	-	-	0.4	0.8	-	-
	-	-	-	-	-	0.4	-	0.4	0.8	-	-
	-	-	-	-	-	-	0.4	0.4	0.8	-	-

Position	SAR (W/kg)									Ri (mm)	SPLS Ratio
	5.8G Wifi 802.11a Ant0	5.8G Wifi 802.11a Ant1	5.8G Wifi 802.11 n20	5.8G Wifi 802.11 ac20	5.8G Wifi 802.11 n40	5.8G Wifi 802.11 ac40	5.8G Wifi 802.11 ac80	2.4GHz BT/ BLE	Sum of SAR		
Back Touch	1.43	-	-	-	-	-	-	0.152	1.582	-	-
	-	1.23	-	-	-	-	-	0.152	1.382	-	-
	-	-	1.43	-	-	-	-	0.152	1.582	-	-
	-	-	-	1.43	-	-	-	0.152	1.582	-	-
	-	-	-	-	1.01	-	-	0.152	1.162	-	-
	-	-	-	-	-	1.43	-	0.152	1.582	-	-
	-	-	-	-	-	-	0.90	0.152	1.054	-	-
Top Touch	1.43	-	-	-	-	-	-	0.159	1.589	-	-
	-	1.35	-	-	-	-	-	0.159	1.514	-	-
	-	-	1.38	-	-	-	-	0.159	1.542	-	-
	-	-	-	1.40	-	-	-	0.159	1.561	-	-
	-	-	-	-	1.41	-	-	0.159	1.571	-	-
	-	-	-	-	-	1.44	-	0.159	1.597	-	-
	-	-	-	-	-	-	1.35	0.159	1.514	-	-
Left Touch	0.4	-	-	-	-	-	-	0.11	0.51	-	-
	-	0.4	-	-	-	-	-	0.11	0.51	-	-
	-	-	0.4	-	-	-	-	0.11	0.51	-	-
	-	-	-	0.4	-	-	-	0.11	0.51	-	-
	-	-	-	-	0.4	-	-	0.11	0.51	-	-
	-	-	-	-	-	0.4	-	0.11	0.51	-	-
	-	-	-	-	-	-	0.4	0.11	0.51	-	-
Right Touch	0.4	-	-	-	-	-	-	0.4	0.8	-	-
	-	0.4	-	-	-	-	-	0.4	0.8	-	-
	-	-	0.4	-	-	-	-	0.4	0.8	-	-
	-	-	-	0.4	-	-	-	0.4	0.8	-	-
	-	-	-	-	0.4	-	-	0.4	0.8	-	-
	-	-	-	-	-	0.4	-	0.4	0.8	-	-
	-	-	-	-	-	-	0.4	0.4	0.8	-	-

10.3.3 Off-Shelf USB Dongle Enabled Hotspot Function

If the device enables hotspot through USB-Ethernet dongle, simultaneous transmission need to be considered. According to FCC KDB 941225, a reported SAR of 1.6 W/kg is used for the external transmitter to determine simultaneous transmission SAR test exclusion. For USB dongles, the peak SAR location is assumed to be at 1 cm or less from the router surface, on the USB dongle.
Distance between Wi-Fi antennas and the USB dongle applied in the following table is demonstrated in the diagram in Section 10.3 of this report. The Wi-Fi standalone SAR values are selected either from the measurement results in Section 10.2 or from the estimated SAR in Section 10.3.1 of this report whichever is higher. The highest back side touch SAR value in each operating frequency band was picked to represent the worst case.

Frequency Band	Antenna	Wi-Fi SAR (W/kg)	USB Dongle SAR (W/kg)	Separation Distance (mm)	SPLSR
BT/BLE	0	0.152	1.6	217	0.01
2.4 GHz	0	1.17	1.6	217	0.02
	1	1.54	1.6	224	0.02
5.2 GHz	0	1.01	1.6	217	0.02
	1	0.87	1.6	224	0.02
5.3 GHz	0	1.13	1.6	217	0.02
	1	1.03	1.6	224	0.02
5.6 GHz	0	1.27	1.6	217	0.02
	1	0.84	1.6	224	0.02
5.8 GHz	0	1.43	1.6	217	0.02
	1	1.23	1.6	224	0.02

As shown in the table above, simultaneous transmission SAR can be excluded for hotspot configuration since SPLSR is less than 0.04.

11 Appendix A – Measurement Uncertainty

The uncertainty budget has been determined for the DASY4 measurement system and is given in the following Table.

Below 3 GHz

DASY4 Uncertainty Budget								
Error Description	Uncertainty Value	Prob. Dist.	Div.	(c i) 1g	(c i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v i) veff
Measurement System								
Probe Calibration (2450 MHz)	± 6.0 %	N	1	1	1	± 6.0 %	± 6.0 %	∞
Axial Isotropy	± 0.25 %	R	$\sqrt{3}$	0.7	0.7	± 1.0 %	± 1.0 %	∞
Hemispherical Isotropy	± 1.3 %	R	$\sqrt{3}$	0.7	0.7	± 0.53 %	± 0.53 %	∞
Boundary Effects	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Linearity	± 0.3 %	R	$\sqrt{3}$	1	1	± 0.17 %	± 0.17 %	∞
System Detection Limits	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Modulation Response	± 1.65 %	R	$\sqrt{3}$	1	1	± 0.95 %	± 0.95 %	∞
Readout Electronics	± 0.3 %	N	1	1	1	± 0.3 %	± 0.3 %	∞
Response Time	± 0.8 %	R	$\sqrt{3}$	1	1	± 0.5 %	± 0.5 %	∞
Integration Time	± 2.6 %	R	$\sqrt{3}$	1	1	± 1.5 %	± 1.5 %	∞
RF Ambient Noise	± 3.0 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
RF Ambient Conditions	± 3.0 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Probe Positioner	± 0.4 %	R	$\sqrt{3}$	1	1	± 0.2 %	± 0.2 %	∞
Probe Positioning	± 2.9 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∞
Max. SAR Eval.	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∞
Test Sample Related								
Device Positioning	± 2.9 %	N	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6 %	N	1	1	1	± 3.6 %	± 2.6 %	5
Power Drift	± 5.0 %	R		1	1	± 2.9 %	± 2.9 %	∞
Phantom and Setup								
Phantom Uncertainty	± 4.0 %	R	$\sqrt{3}$	1	1	± 2.3 %	± 2.3 %	∞
Liquid Conductivity (Target)	± 5.0 %	R	$\sqrt{3}$	0.64	0.43	± 1.8 %	± 1.2 %	∞
Liquid Conductivity (meas.)	± 2.5 %	N	1	0.64	0.43	± 1.6 %	± 1.1 %	∞
Liquid Permittivity (Target)	± 5.0 %	R	$\sqrt{3}$	0.6	0.49	± 1.7 %	± 1.4 %	∞
Liquid Permittivity (meas.)	± 2.5 %	N	1	0.6	0.49	± 1.5 %	± 1.2 %	∞
Combined Std. Uncertainty	-	RSS	-	-	-	± 9.4 %	± 9.3 %	330
Expanded STD Uncertainty	-	2	-	-	-	± 18.9 %	± 18.5 %	-

Above 3 GHz

DASY4 Uncertainty Budget								
Error Description	Uncertainty Value	Prob. Dist.	Div.	(c i) 1g	(c i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v i) veff
Measurement System								
Probe Calibration (5 GHz)	± 6.55 %	N	1	1	1	± 6.55 %	± 6.55 %	∝
Axial Isotropy	± 0.25 %	R	$\sqrt{3}$	0.7	0.7	± 0.1 %	± 0.1 %	∝
Hemispherical Isotropy	± 1.3%	R	$\sqrt{3}$	0.7	0.7	± 0.53 %	± 0.53 %	∝
Boundary Effects	± 2.0 %	R	$\sqrt{3}$	1	1	± 1.2 %	± 1.2 %	∝
Linearity	± 0.3 %	R	$\sqrt{3}$	1	1	± 0.17 %	± 0.17 %	∝
System Detection Limits	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∝
Modulation Response	± 1.9 %	R	$\sqrt{3}$	1	1	± 1.1%	± 1.1%	∝
Readout Electronics	± 0.3 %	N	1	1	1	± 0.3 %	± 0.3 %	∝
Response Time	0	R	$\sqrt{3}$	1	1	0	0	∝
Integration Time	0	R	$\sqrt{3}$	1	1	0	0	∝
RF Ambient Noise	± 3.0 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∝
RF Ambient Conditions	± 3.0 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∝
Probe Positioner	± 0.8 %	R	$\sqrt{3}$	1	1	± 0.5 %	± 0.5 %	∝
Probe Positioning	± 2.9 %	R	$\sqrt{3}$	1	1	± 1.7 %	± 1.7 %	∝
Max. SAR Eval.	± 1.0 %	R	$\sqrt{3}$	1	1	± 0.6 %	± 0.6 %	∝
Test Sample Related								
Device Positioning	± 2.9 %	N	1	1	1	± 2.9 %	± 2.9 %	145
Device Holder	± 3.6 %	N	1	1	1	± 3.6 %	± 2.6 %	5
Power Drift	± 5.0 %	R		1	1	± 2.9 %	± 2.9 %	∝
Phantom and Setup								
Phantom Uncertainty	± 4.0 %	R	$\sqrt{3}$	1	1	± 2.3 %	± 2.3 %	∝
Liquid Conductivity (Target)	± 5.0 %	R	$\sqrt{3}$	0.64	0.43	± 1.8 %	± 1.2 %	∝
Liquid Conductivity (meas.)	± 2.5 %	N	1	0.64	0.43	± 1.6 %	± 1.1 %	∝
Liquid Permittivity (Target)	± 5.0 %	R	$\sqrt{3}$	0.6	0.49	± 1.7 %	± 1.4 %	∝
Liquid Permittivity (meas.)	± 2.5 %	N	1	0.6	0.49	± 1.5 %	± 1.2 %	∝
Combined Std. Uncertainty	-	RSS	-	-	-	± 9.7 %	± 9.6 %	330
Expanded STD Uncertainty	-	2	-	-	-	± 19.4 %	± 19.2 %	-

12 Appendix B - Probe Calibration Certificates

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 BACL

Certificate No: ES3-3019_Aug15

CALIBRATION CERTIFICATE

Object: ES3DV2 - SN:3019

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

Calibration date: August 19, 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-14)	In house check: Oct-15

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

Issued: August 20, 2015

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

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

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV2

SN:3019

Manufactured: December 5, 2002
Calibrated: August 19, 2015

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

DASY/EASY - Parameters of Probe: ES3DV2 - SN:3019

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.03	1.15	0.96	± 10.1 %
DCP (mV)[B]	106.1	103.8	104.7	

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	184.6	±3.3 %
		Y	0.0	0.0	1.0		195.7	
		Z	0.0	0.0	1.0		186.6	

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 Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV2 - SN:3019

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
450	43.5	0.87	6.75	6.75	6.75	0.18	1.70	± 13.4 %
750	41.9	0.89	6.54	6.54	6.54	0.21	2.00	± 12.0 %
835	41.5	0.90	6.23	6.23	6.23	0.34	1.49	± 12.0 %
1750	40.1	1.37	5.11	5.11	5.11	0.53	1.28	± 12.0 %
1900	40.0	1.40	4.86	4.86	4.86	0.63	1.16	± 12.0 %
2450	39.2	1.80	4.16	4.16	4.16	0.45	1.62	± 12.0 %
2600	39.0	1.96	4.00	4.00	4.00	0.70	1.30	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: ES3DV2 - SN:3019

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
450	56.7	0.94	7.03	7.03	7.03	0.13	1.50	± 13.4 %
750	55.5	0.96	6.34	6.34	6.34	0.19	2.28	± 12.0 %
835	55.2	0.97	6.25	6.25	6.25	0.35	1.60	± 12.0 %
1750	53.4	1.49	4.71	4.71	4.71	0.38	1.66	± 12.0 %
1900	53.3	1.52	4.48	4.48	4.48	0.45	1.52	± 12.0 %
2450	52.7	1.95	3.95	3.95	3.95	0.66	1.25	± 12.0 %
2600	52.5	2.16	3.79	3.79	3.79	0.79	1.07	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

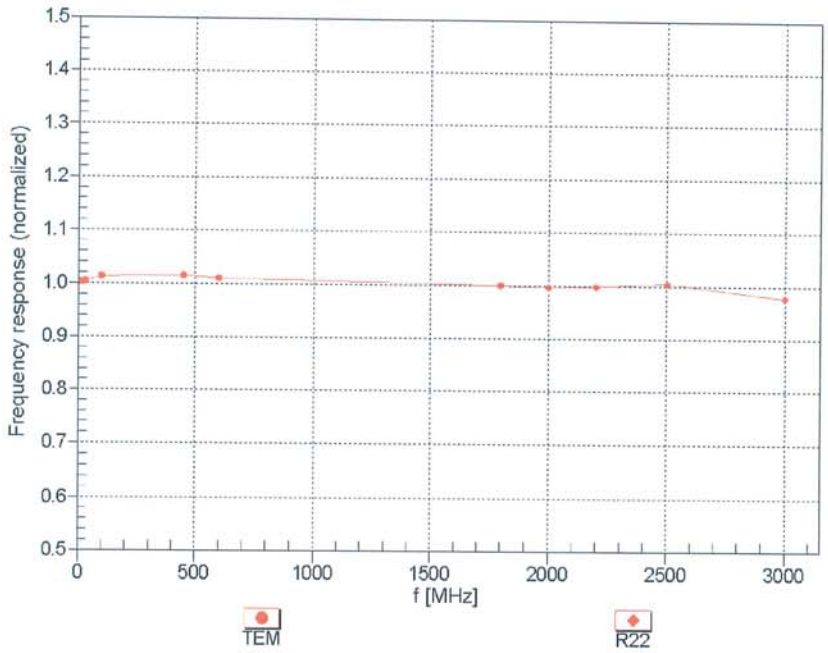
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

ES3DV2– SN:3019

August 19, 2015

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



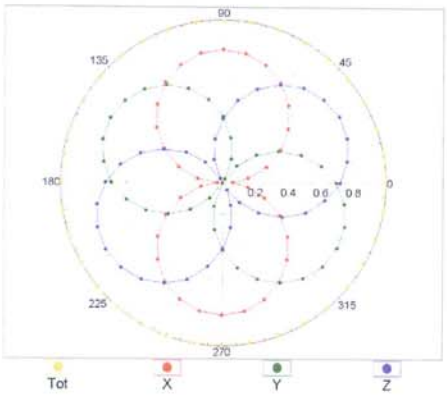
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

ES3DV2– SN:3019

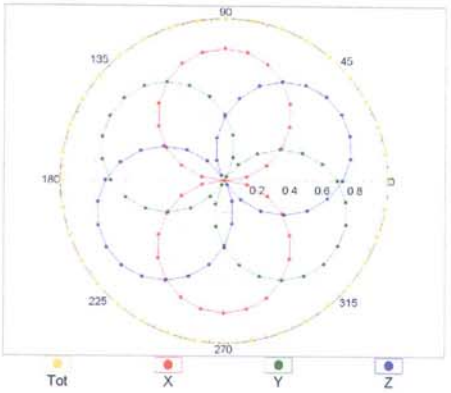
August 19, 2015

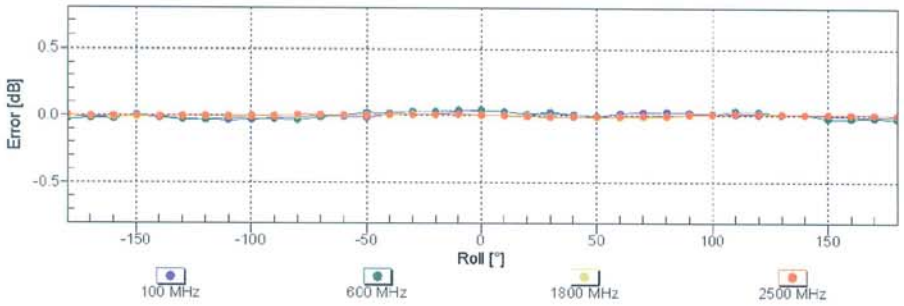
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22



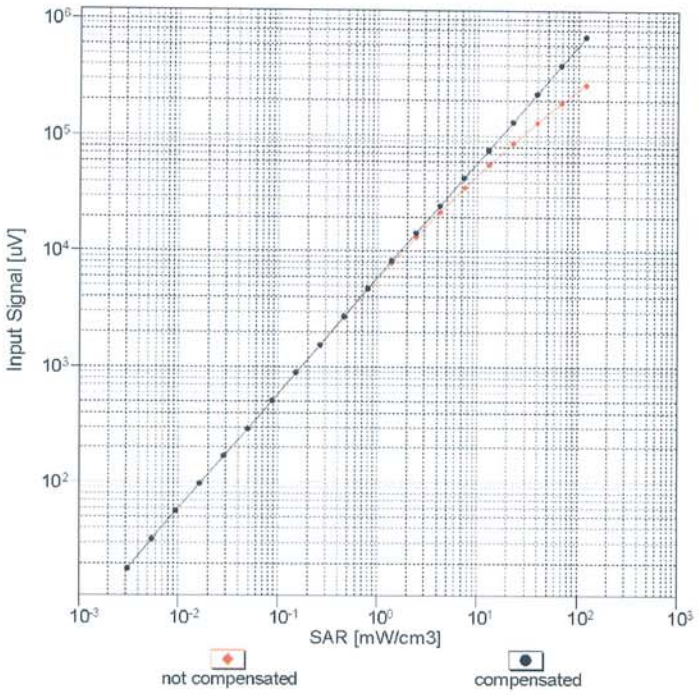


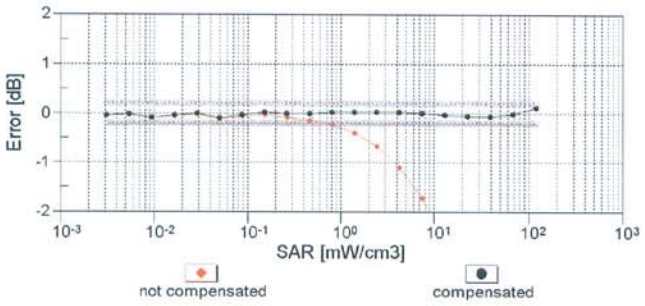
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

ES3DV2– SN:3019

August 19, 2015

Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)





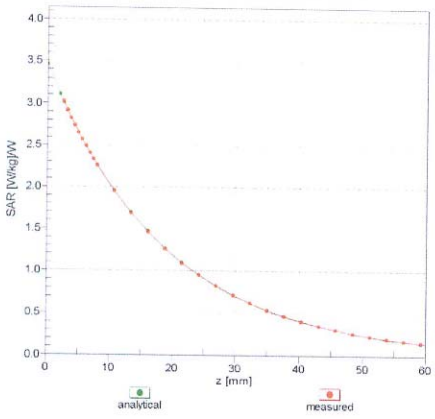
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ES3DV2– SN:3019

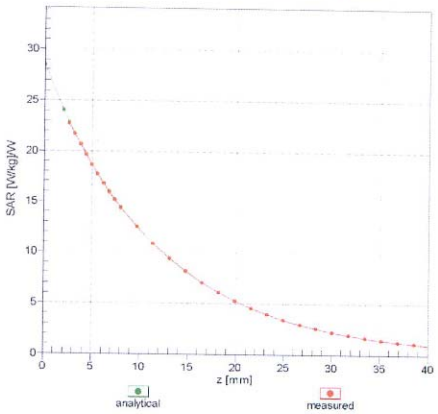
August 19, 2015

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

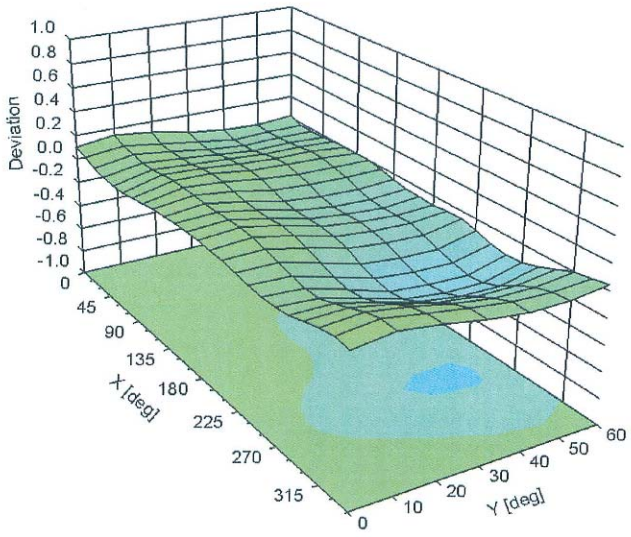


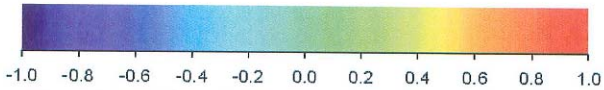
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: ES3DV2 - SN:3019

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	110.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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 BACL

Certificate No: EX3-3619_Oct15

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3619

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: October 20, 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:	Israe Elnaouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 22, 2015

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

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

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z*: *A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:3619

Manufactured: July 3, 2007
Calibrated: October 20, 2015

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3619

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.45	0.38	0.41	± 10.1 %
DCP (mV)[B]	99.0	99.2	98.8	

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	157.0	±3.8 %
		Y	0.0	0.0	1.0		142.9	
		Z	0.0	0.0	1.0		147.3	

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 Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3619

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
600	42.7	0.88	8.67	8.67	8.67	0.10	1.15	± 13.3 %
5250	35.9	4.71	4.26	4.26	4.26	0.35	1.80	± 13.1 %
5600	35.5	5.07	3.68	3.68	3.68	0.50	1.80	± 13.1 %
5800	35.3	5.27	3.77	3.77	3.77	0.50	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3619

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
600	56.1	0.95	8.65	8.65	8.65	0.10	1.15	± 13.3 %
5250	48.9	5.36	3.80	3.80	3.80	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.23	3.23	3.23	0.55	1.90	± 13.1 %
5800	48.2	6.00	3.54	3.54	3.54	0.55	1.90	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

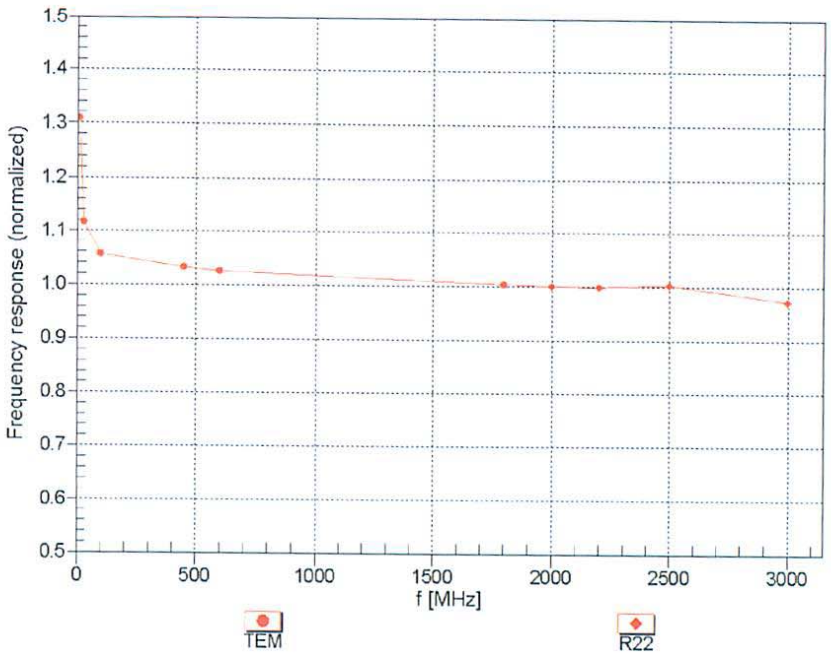
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

EX3DV4– SN:3619

October 20, 2015

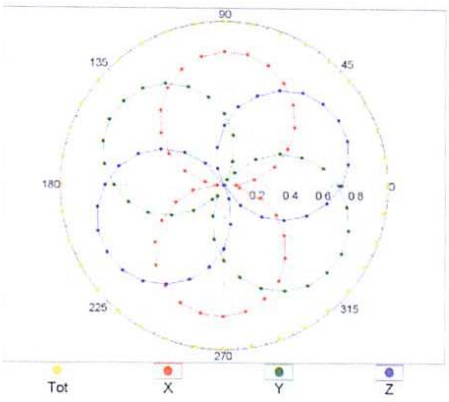
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



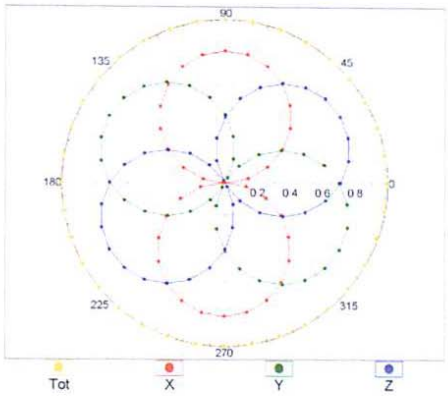
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

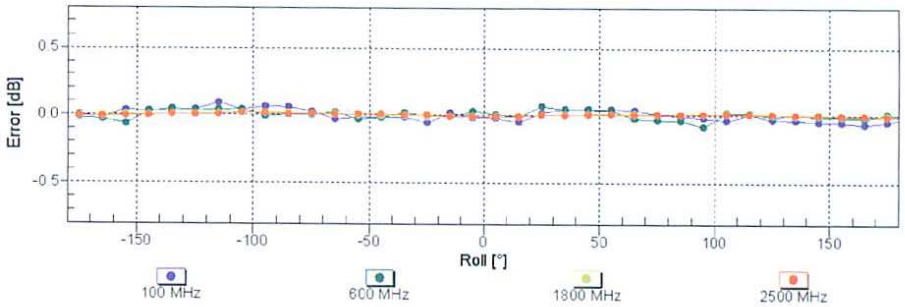
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

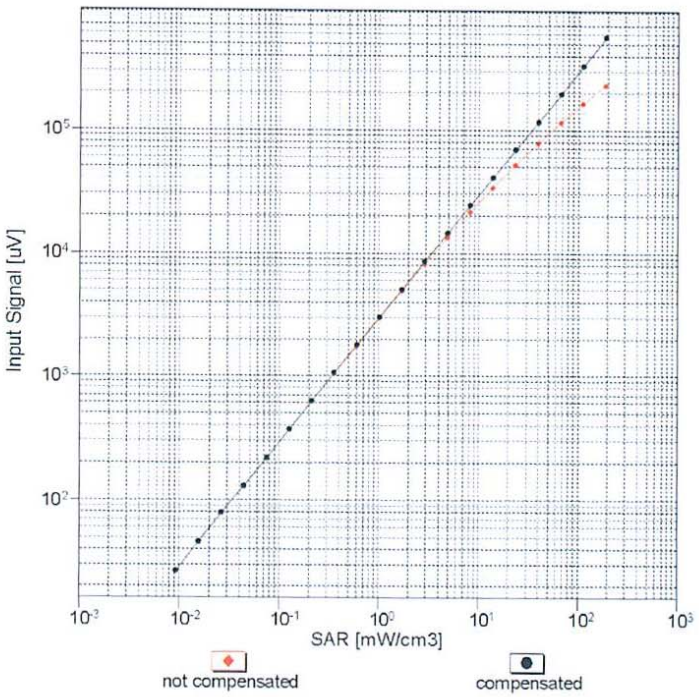


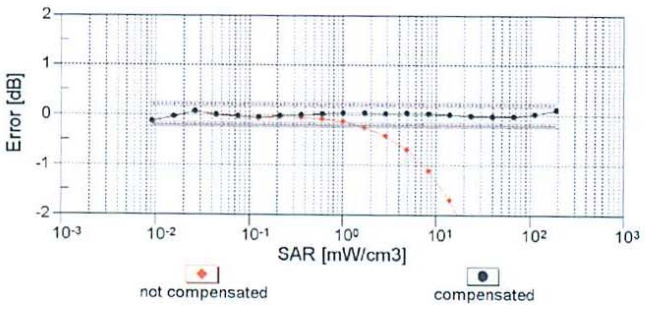


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4– SN:3619 October 20, 2015

Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)



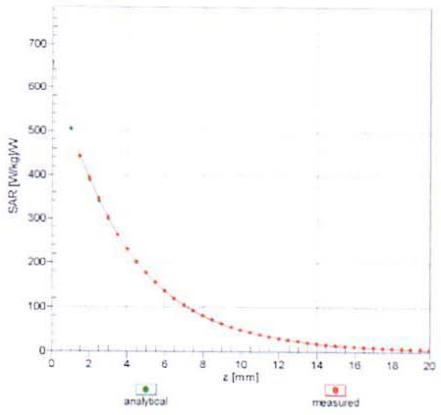


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

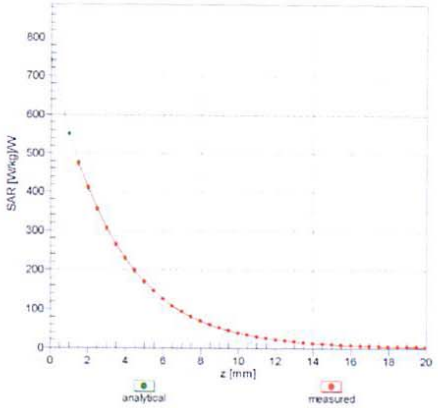
EX3DV4– SN:3619 October 20, 2015

Conversion Factor Assessment

f = 5250 MHz,WGLS R58 (H_convF)-SCS

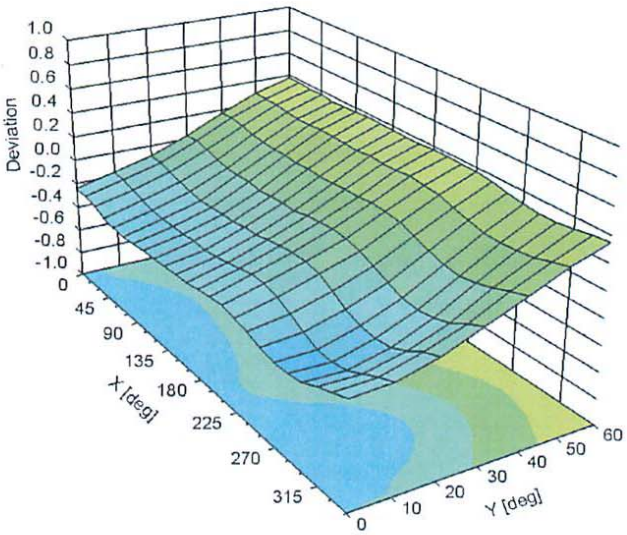


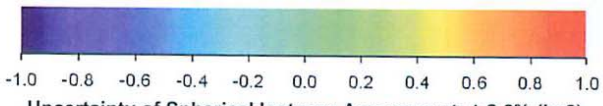
f = 5800 MHz,WGLS R58 (H_convF)-SCS



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3619

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	25.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

13 Appendix C – Dipole Calibration Certificates

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1578
Project Number: BACL-dipole-cal-5774

CERTIFICATE OF CALIBRATION

It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

BACL Validation Dipole (Head & Body)

Manufacturer: APREL Laboratories
Part number: D-2450-S-1
Frequency: 2450 MHz
Serial No: BCL-141

Customer: Bay Area Compliance Laboratory

Calibrated: 19th August 2014
Released on: 20th August 2014

This Calibration Certificate is Incomplete Unless Accompanied with the Calibration Results Summary

Released By:

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

Suite 102, 303 Terry Fox Dr. Kanata, ONTARIO CANADA K2K 3J1
Division of APREL Lab. TEL: (613) 435-6300 FAX: (613) 432-8306

NCL Calibration Laboratories
Division of APREL Laboratories.

Conditions

Dipole BCL-141 was received from customer in good condition for re-calibration, SMA connector required cleaning prior to calibration.

Ambient Temperature of the Laboratory: 22 °C ± 0.5°C
Temperature of the Tissue: 21 °C ± 0.5°C

Attestation

The below named signatories have conducted the calibration and review of the data which is presented in this calibration report.

We the undersigned attest that to the best of our knowledge the calibration of this subject has been accurately conducted and that all information contained within the results pages have been reviewed for accuracy.

Art Brennan, Quality Manager

Maryna Nesterova Calibration Engineer

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NCL Calibration Laboratories
Division of APREL Laboratories.

Calibration Results Summary

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

Length: 49.8 mm
Height: 29.9 mm

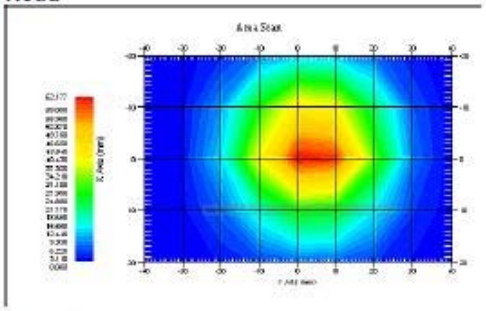
Electrical Calibration

Test	Result Head	Result Body
S11 R/L	-28.771 dB	-24.946 dB
SWR	1.075 U	1.120 U
Impedance	53.072 Ω	55.701 Ω

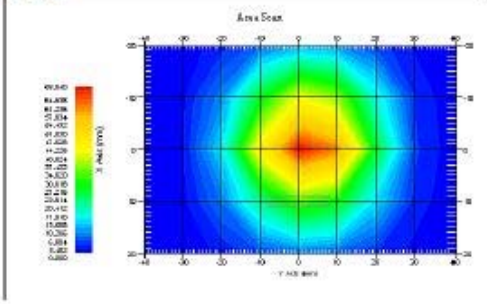
System Validation Results

Frequency 2450 MHz	1 Gram	10 Gram
Head	52.985	24.065
Body	56.519	24.855

Head



Body



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Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole BCL-141. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 30 MHz to 6 GHz E-Field Probe Serial Number 225.

References

- SSI-TP-018-ALSAS Dipole Calibration Procedure
- SSI-TP-016 Tissue Calibration Procedure
- IEEE 1528 "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques"
- IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
- Part 1: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 300 MHz to 3 GHz)"
- IEC-62209 "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures"
- Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for hand-held devices used in close proximity of the ear (frequency range of 30 MHz to 6 GHz)"
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9 kHz to 40 GHz

Conditions

Dipole BCL-141 was received from customer in good condition for re-calibration, SMA connector required cleaning prior to calibration.

Ambient Temperature of the Laboratory: 21 °C ± 0.5°C
Temperature of the Tissue: 20 °C ± 0.5°C

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Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
51.0 mm	30.0 mm	49.8 mm	29.9 mm

Tissue Validation

Tissue 2450MHz	Measured Head	Measured Body
Dielectric constant, ε_r	37.61	53.69
Conductivity, σ [S/m]	1.86	1.96

Dipole Calibration uncertainty

The calibration uncertainty for the dipole is made up of various parameters presented below.

Mechanical	1%
Positioning Error	1.22%
Electrical	1.7%
Tissue	2.2%
Dipole Validation	2.2%
TOTAL	**8.32% (16.64% K=2)**

Primary Measurement Standards

Instrument	Serial Number	Cal due date
Tektronix USB Power Meter	11C940	May 14, 2015
Network Analyzer Anritsu 37347C	002106	Feb. 20, 2015
Agilent Signal Generator	MY45094463	Dec. 2015

We have a two year calibration interval.

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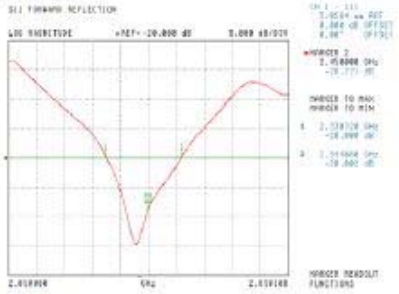
Electrical Calibration

Test	Result Head	Result Body
S11 R/L	-28.771 dB	-24.946 dB
SWR	1.075 U	1.120 U
Impedance	53.072 Ω	55.701 Ω

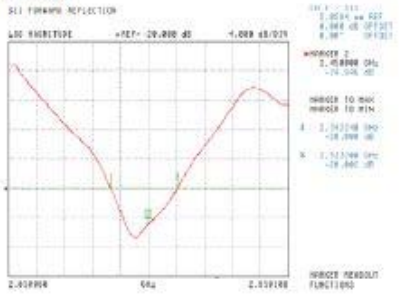
The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss
HEAD



Frequency Range 2330 MHz to 2544 MHz

BODY



Frequency Range 2342 MHz to 2532 MHz

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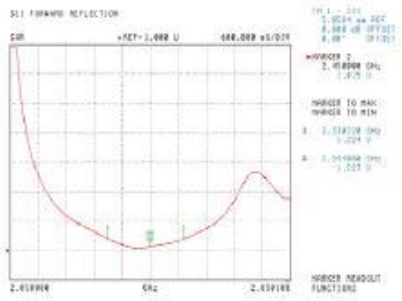
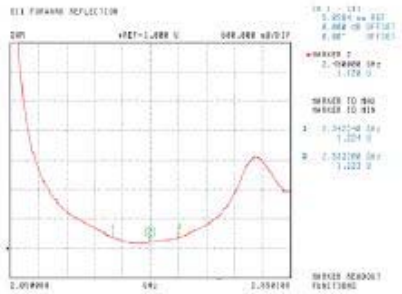
SWR

Head



Body



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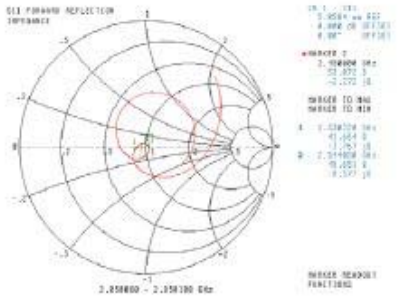
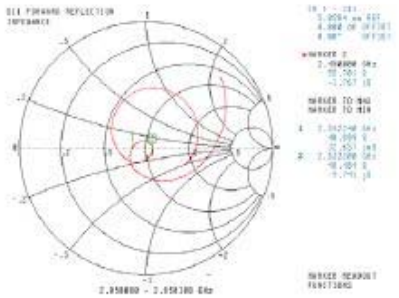
Smith Chart Dipole Impedance

Head



Body



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Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2014.

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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
S Swiss Calibration Service

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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 BACL **Certificate No: D5GHzV2-1001_Aug14**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1001
Calibration procedure(s)	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	August 19, 2014

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°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	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe EX3DV4	SN: 3503	30-Dec-13 (No. EX3-3503_Dec13)	Dec-14
DAE4	SN: 601	30-Apr-14 (No. DAE4-601_Apr14)	Apr-15
DAE4	SN: 601	18-Aug-14 (No. DAE4-601_Aug14)	Aug-15

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M. Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 20, 2014

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

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

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S Swiss Calibration Service

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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

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) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
c) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

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	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.6 ± 6 %	4.52 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.8 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.1 ± 6 %	4.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.9 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.1 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	33.9 ± 6 %	5.06 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.9 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.9 ± 6 %	5.38 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.65 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.3 ± 6 %	5.84 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**80.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.26 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.0 ± 6 %	6.12 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.63 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.0 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	51.1 Ω - 7.4 jΩ
Return Loss	- 22.6 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	53.0 Ω - 4.1 jΩ
Return Loss	- 26.1 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	55.5 Ω + 2.4 jΩ
Return Loss	- 24.9 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	51.5 Ω - 5.2 jΩ
Return Loss	- 25.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	54.3 Ω - 1.7 jΩ
Return Loss	- 27.0 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	55.0 Ω + 3.0 jΩ
Return Loss	- 25.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 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	April 02, 2003

DASY5 Validation Report for Head TSL

Date: 14.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1001

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5250 MHz; σ = 4.52 S/m; ε_r = 34.6; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.86 S/m; ε_r = 34.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.06 S/m; ε_r = 33.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

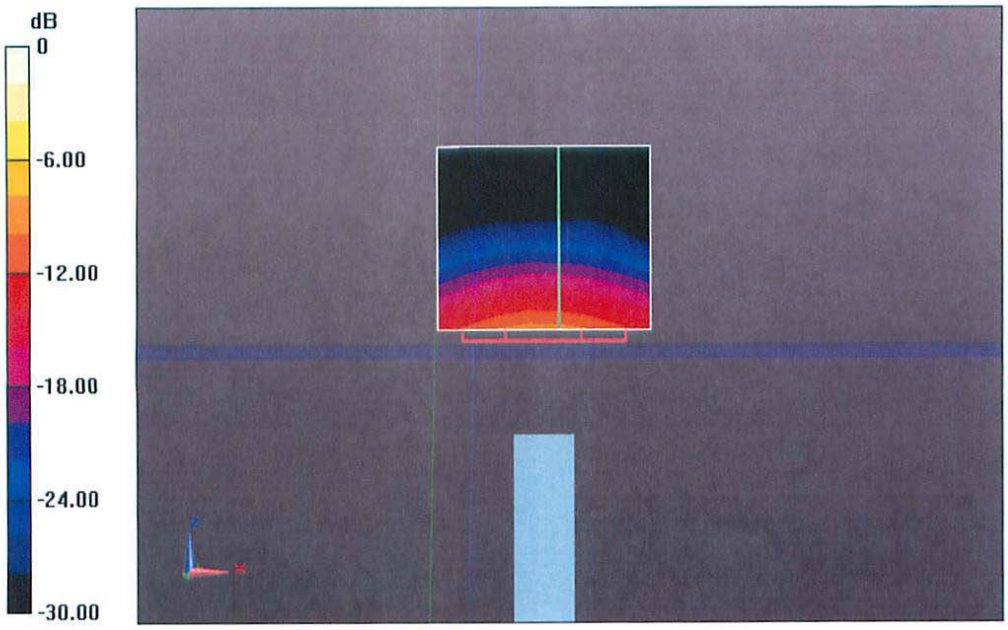
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.36, 5.36, 5.36); Calibrated: 30.12.2013, ConvF(4.86, 4.86, 4.86); Calibrated: 30.12.2013, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.22 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 30.7 W/kg
SAR(1 g) = 8.43 W/kg; SAR(10 g) = 2.41 W/kg
Maximum value of SAR (measured) = 19.2 W/kg

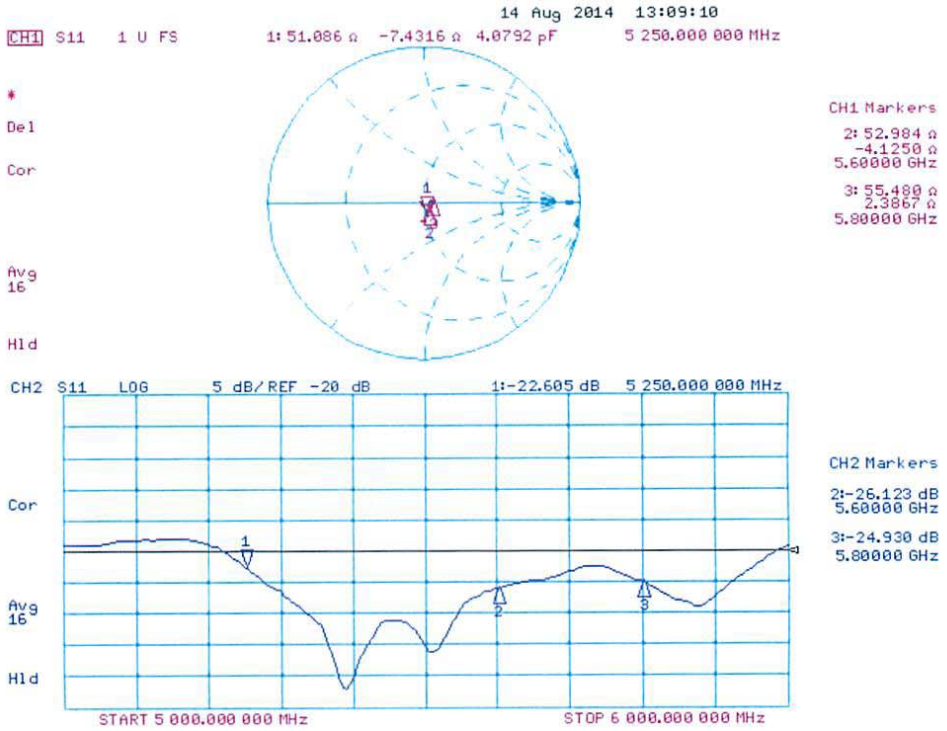
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.13 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 34.0 W/kg
SAR(1 g) = 8.58 W/kg; SAR(10 g) = 2.44 W/kg
Maximum value of SAR (measured) = 20.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.06 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 34.2 W/kg
SAR(1 g) = 8.19 W/kg; SAR(10 g) = 2.32 W/kg
Maximum value of SAR (measured) = 19.7 W/kg



0 dB = 19.7 W/kg = 12.94 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.08.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1001

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5250 MHz; σ = 5.38 S/m; ε_r = 46.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.84 S/m; ε_r = 46.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.12 S/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

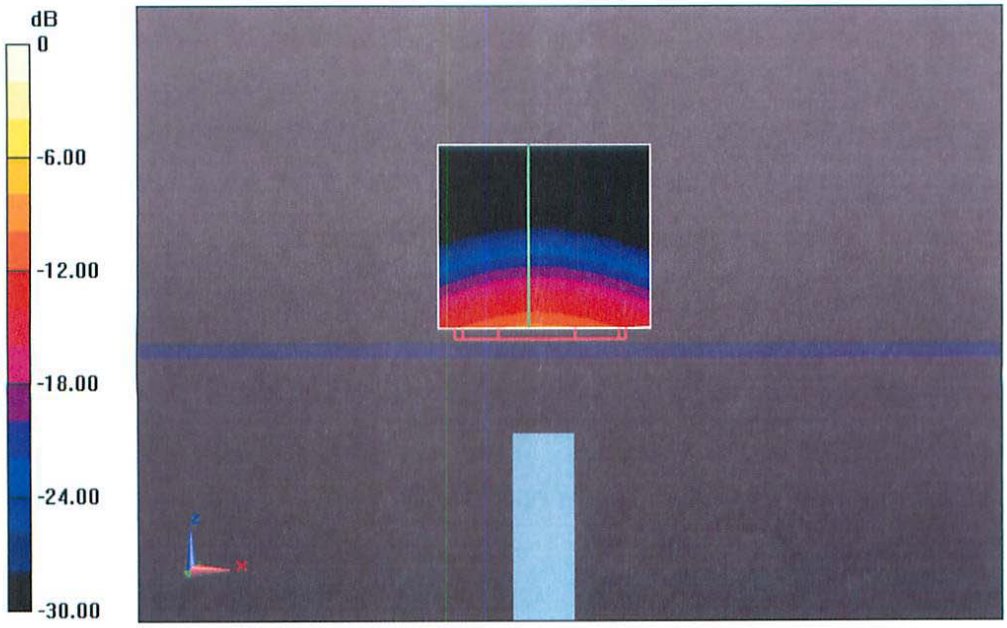
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.89, 4.89, 4.89); Calibrated: 30.12.2013, ConvF(4.3, 4.3, 4.3); Calibrated: 30.12.2013, ConvF(4.47, 4.47, 4.47); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 18.08.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.75 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 29.6 W/kg
SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.15 W/kg
Maximum value of SAR (measured) = 17.9 W/kg

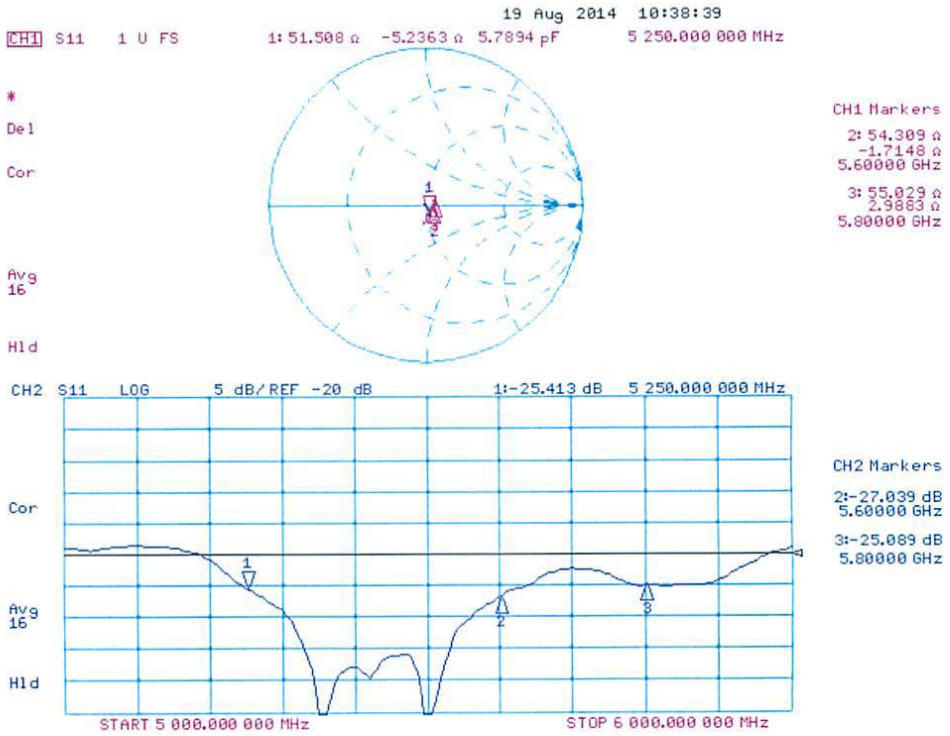
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.53 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 34.7 W/kg
SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.26 W/kg
Maximum value of SAR (measured) = 19.9 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 56.74 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 34.5 W/kg
SAR(1 g) = 7.63 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 18.8 W/kg



0 dB = 18.8 W/kg = 12.74 dBW/kg

Impedance Measurement Plot for Body TSL



14 Appendix D - Test System Verifications Scans

Test Laboratory: Bay Area Compliance Lab Corp. (BACL)

2450 MHz Body System Validation

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: BCL-141

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2 mho/m; ε_r = 53.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

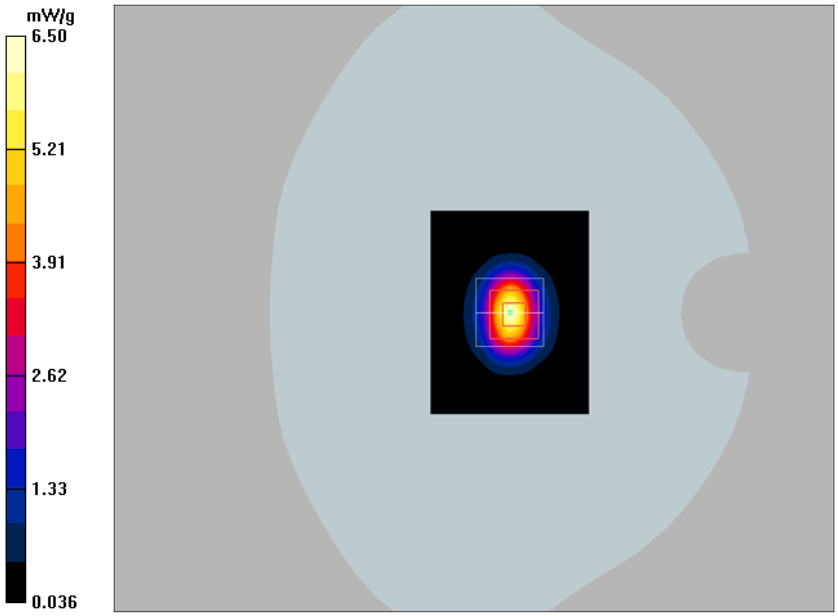
DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(3.95, 3.95, 3.95); Calibrated: 8/19/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

d = 10mm, Pin = 0.1W/Area Scan (71x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 6.35 mW/g

d = 10mm, Pin = 0.1W/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.5 V/m; Power Drift = 0.278 dB
Peak SAR (extrapolated) = 13.2 W/kg

SAR(1 g) = 5.88 mW/g; SAR(10 g) = 2.64 mW/g
Maximum value of SAR (measured) = 6.50 mW/g



Test Laboratory: Bay Area Compliance Lab Corp. (BACL)

5250 MHz Body System Validation

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 SN: 1001

Communication System: CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5250 MHz; σ = 5.12 mho/m; ε_r = 47.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

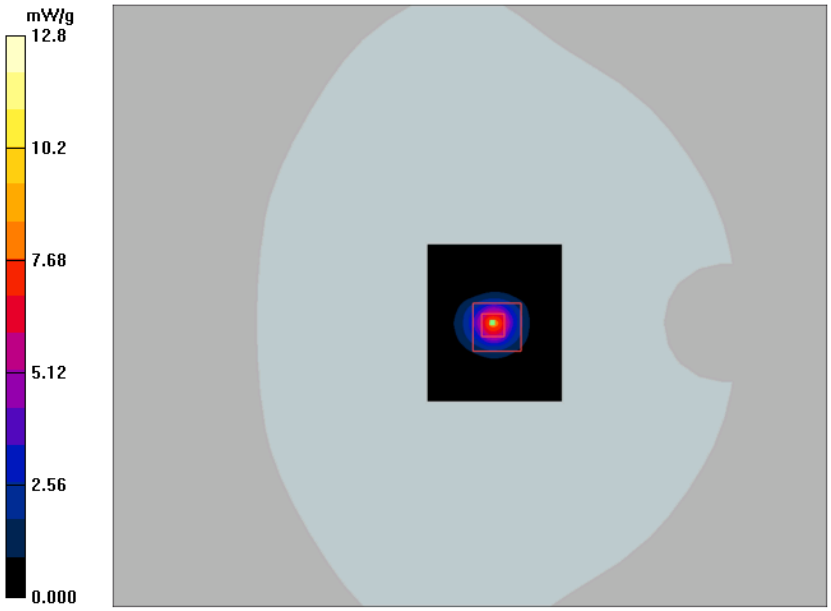
DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

d = 10mm, Pin = 0.1W/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 8.08 mW/g

d = 10mm, Pin = 0.1W/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 37.4 V/m; Power Drift = 0.287 dB
Peak SAR (extrapolated) = 24.9 W/kg

SAR(1 g) = 6.96 mW/g; SAR(10 g) = 2.04 mW/g
Maximum value of SAR (measured) = 12.8 mW/g



Test Laboratory: Bay Area Compliance Lab Corp. (BACL)

5600 MHz Body System Validation

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 SN: 1001

Communication System: CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; σ = 5.63 mho/m; ε_r = 46.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

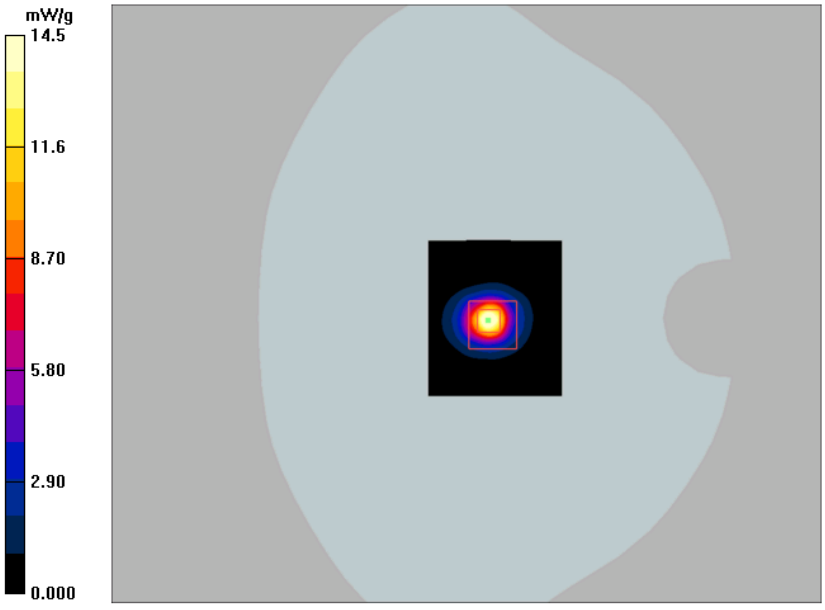
DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.23, 3.23, 3.23); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

d = 10mm, Pin = 0.1W/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 16.2 mW/g

d = 10mm, Pin = 0.1W/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 36.1 V/m; Power Drift = 0.302 dB
Peak SAR (extrapolated) = 27.7 W/kg

SAR(1 g) = 7.57 mW/g; SAR(10 g) = 2.21 mW/g
Maximum value of SAR (measured) = 14.5 mW/g



Test Laboratory: Bay Area Compliance Lab Corp. (BACL)

5800 MHz Body System Validation

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 SN: 1001

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 5.92 mho/m; ε_r = 46.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

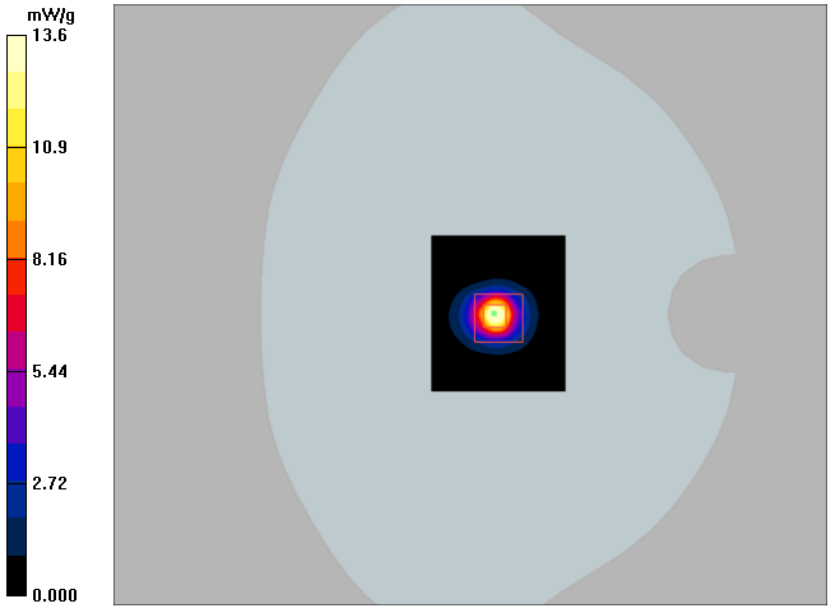
DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.54, 3.54, 3.54); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

d = 10mm, Pin = 0.1W/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 15.2 mW/g

d = 10mm, Pin = 0.1W/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 35.2 V/m; Power Drift = 0.314 dB
Peak SAR (extrapolated) = 27.4 W/kg

SAR(1 g) = 7.15 mW/g; SAR(10 g) = 2.06 mW/g
Maximum value of SAR (measured) = 13.6 mW/g



15 Appendix E - EUT Scan Results

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom - B Ant 0 (Channel 9)

DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11b; Frequency: 2452 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2452 MHz; σ = 2 mho/m; ε_r = 53.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

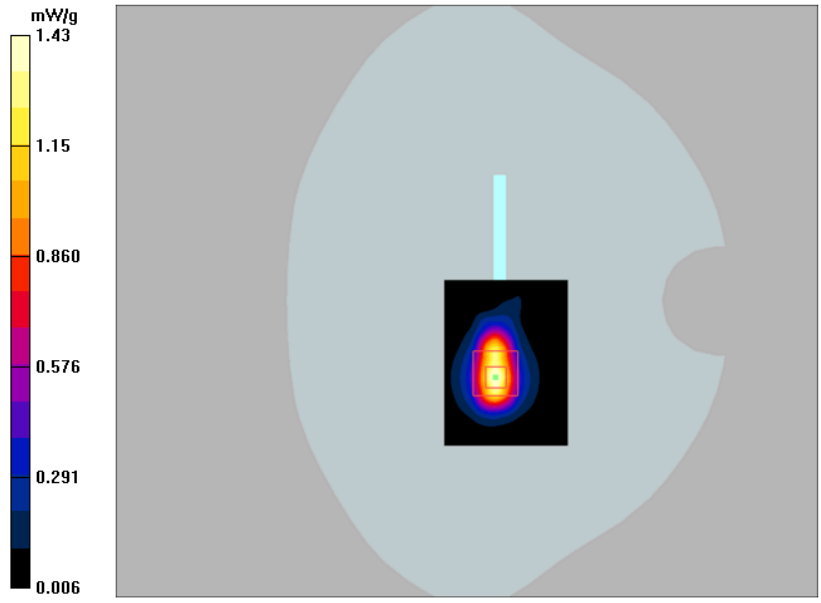
DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(3.95, 3.95, 3.95); Calibrated: 8/19/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (61x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.46 mW/g

Top Side Touch to the Phantom/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.63 V/m; Power Drift = -1.46 dB
Peak SAR (extrapolated) = 2.84 W/kg

SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.540 mW/g
Maximum value of SAR (measured) = 1.43 mW/g



#1

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Back Touch to the Phantom - B Ant 1 (Channel 1)

DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.94 mho/m; ε_r = 53.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

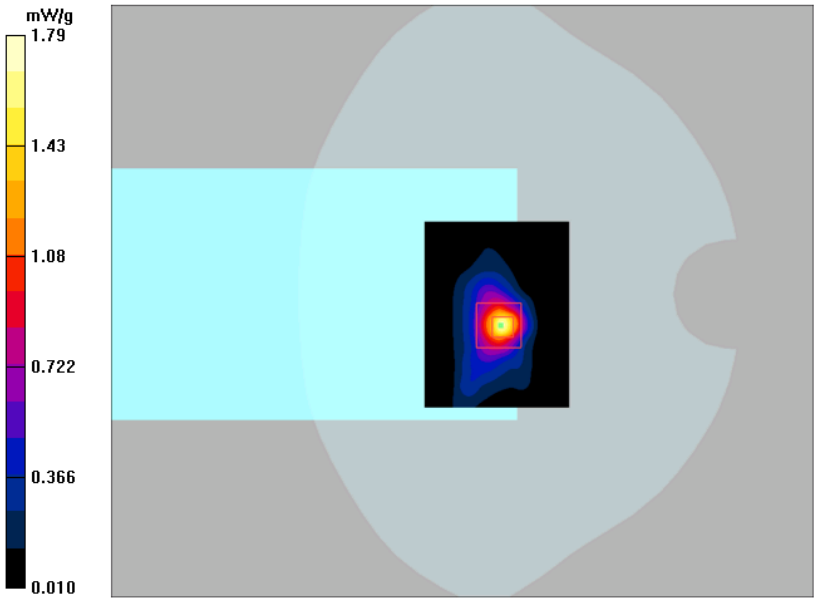
DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(3.95, 3.95, 3.95); Calibrated: 8/19/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Back Side Touch to the Phantom/Area Scan (71x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.72 mW/g

Back Side Touch to the Phantom/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.3 V/m; Power Drift = 0.651 dB
Peak SAR (extrapolated) = 4.49 W/kg

SAR(1 g) = 1.48 mW/g; SAR(10 g) = 0.557 mW/g
Maximum value of SAR (measured) = 1.79 mW/g



#2

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Back Touch to the Phantom - g Ant 1 (Channel 10)

DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11B/G; Frequency: 2457 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2457 MHz; σ = 2 mho/m; ε_r = 53.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

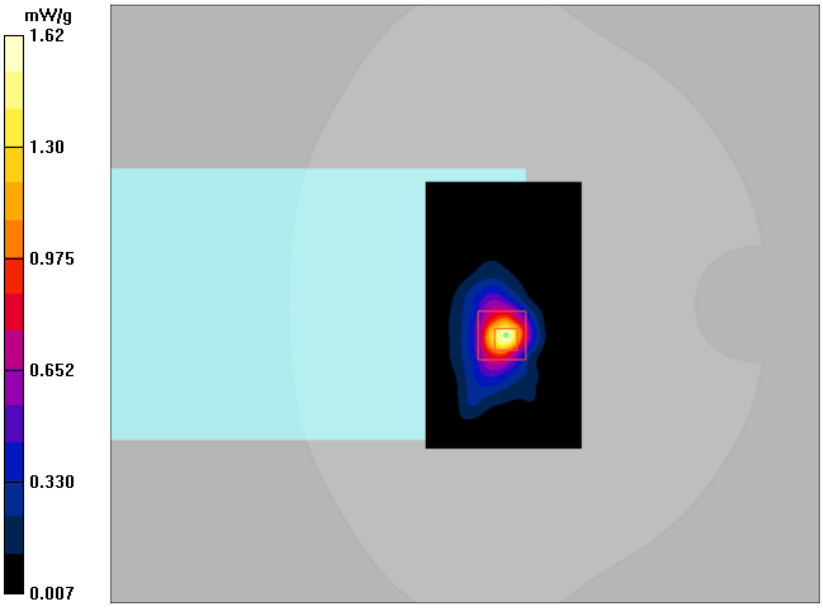
DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(3.95, 3.95, 3.95); Calibrated: 8/19/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Back Side Touch to the Phantom/Area Scan (71x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.60 mW/g

Back Side Touch to the Phantom/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.6 V/m; Power Drift = 1.12 dB
Peak SAR (extrapolated) = 4.22 W/kg

SAR(1 g) = 1.39 mW/g; SAR(10 g) = 0.532 mW/g
Maximum value of SAR (measured) = 1.62 mW/g



#3

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Back Touch to the Phantom - n20 (Channel 2)

DUT: Nvidia; Type: Tablet; Serial: 0424515000201

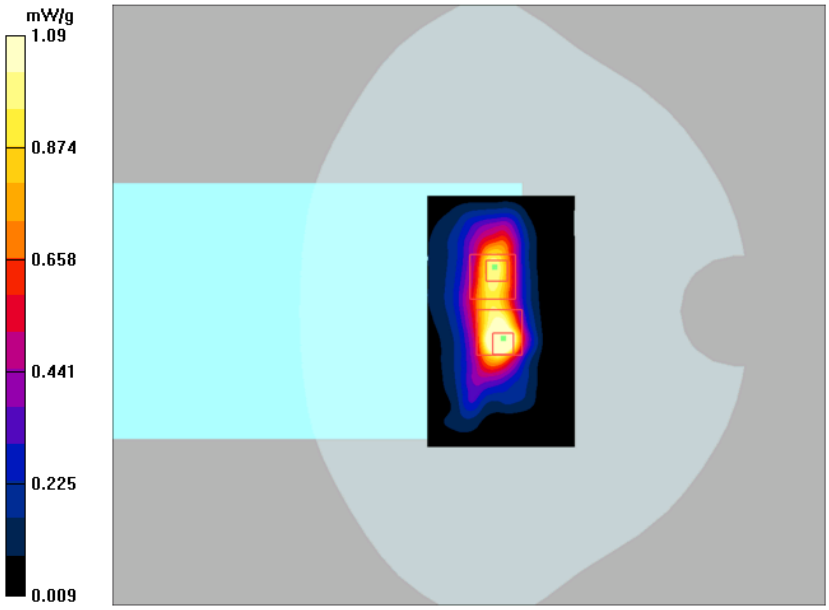
Communication System: 802.11 N20; Frequency: 2417 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2417 MHz; σ = 1.94 mho/m; ε_r = 53.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(3.95, 3.95, 3.95); Calibrated: 8/19/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Back Side Touch to the Phantom/Area Scan (71x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.47 mW/g

Back Side Touch to the Phantom/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.6 V/m; Power Drift = 0.033 dB
Peak SAR (extrapolated) = 3.62 W/kg
SAR(1 g) = 1.27 mW/g; SAR(10 g) = 0.538 mW/g
Maximum value of SAR (measured) = 1.45 mW/g
Back Side Touch to the Phantom/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.6 V/m; Power Drift = 0.033 dB
Peak SAR (extrapolated) = 2.25 W/kg
SAR(1 g) = 0.965 mW/g; SAR(10 g) = 0.448 mW/g
Maximum value of SAR (measured) = 1.09 mW/g



#4

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom - BT GFSK Ant 0 (Channel 39 2441 MHz)

DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2441 MHz; σ = 1.95 mho/m; ε_r = 53.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

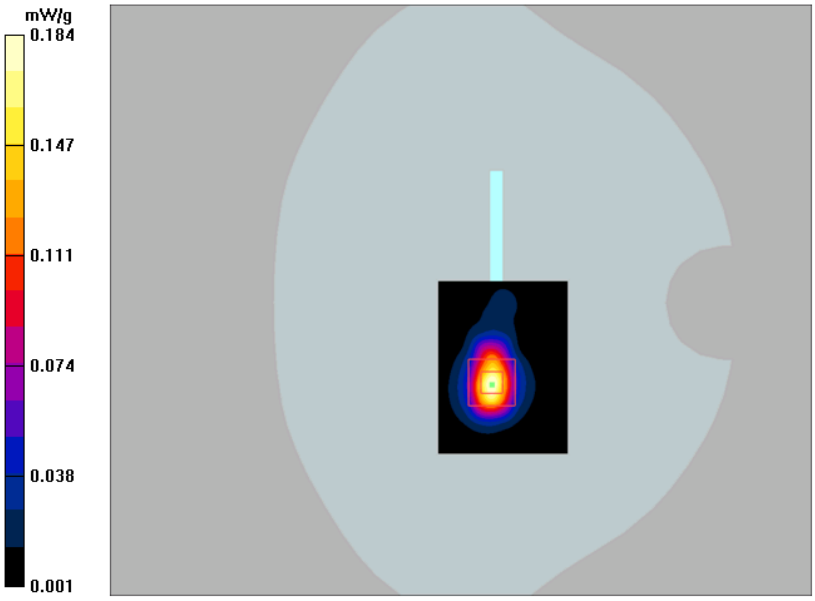
DASY4 Configuration:

- Probe: ES3DV2 - SN3019; ConvF(3.95, 3.95, 3.95); Calibrated: 8/19/2015
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (61x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.187 mW/g

Top Side Touch to the Phantom/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.92 V/m; Power Drift = -0.281 dB
Peak SAR (extrapolated) = 0.350 W/kg

SAR(1 g) = 0.159 mW/g; SAR(10 g) = 0.070 mW/g
Maximum value of SAR (measured) = 0.184 mW/g



#5

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -a Ant1 (Channel 44 5220 MHz)

DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11a; Frequency: 5220 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5220 MHz; σ = 5.1 mho/m; ε_r = 47.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

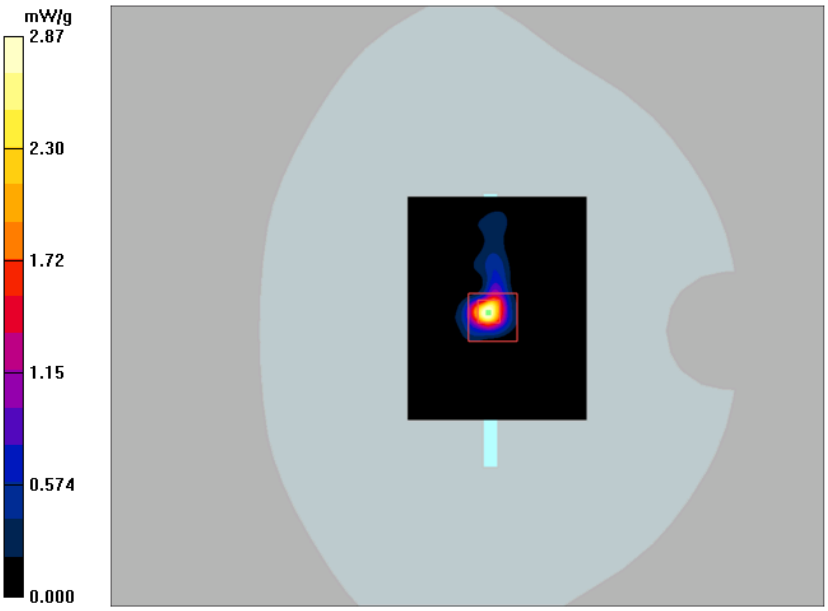
DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.04 mW/g

Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.11 V/m; Power Drift = 0.007 dB
Peak SAR (extrapolated) = 5.47 W/kg

SAR(1 g) = 1.39 mW/g; SAR(10 g) = 0.316 mW/g
Maximum value of SAR (measured) = 2.87 mW/g



#6

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -n20 (Channel 36 5180 MHz)

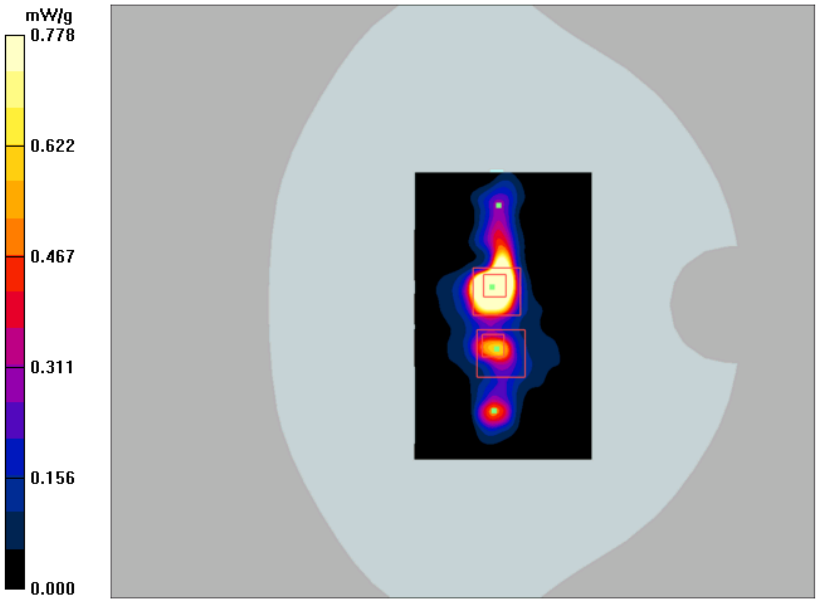
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11n20; Frequency: 5180 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5180 MHz; σ = 5.03 mho/m; ε_r = 47.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.96 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.83 V/m; Power Drift = 1.10 dB
Peak SAR (extrapolated) = 6.00 W/kg
SAR(1 g) = 1.38 mW/g; SAR(10 g) = 0.324 mW/g
Maximum value of SAR (measured) = 2.73 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.83 V/m; Power Drift = 1.10 dB
Peak SAR (extrapolated) = 1.66 W/kg
SAR(1 g) = 0.335 mW/g; SAR(10 g) = 0.084 mW/g
Maximum value of SAR (measured) = 0.778 mW/g



#7

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac20 (Channel 48 5240 MHz)

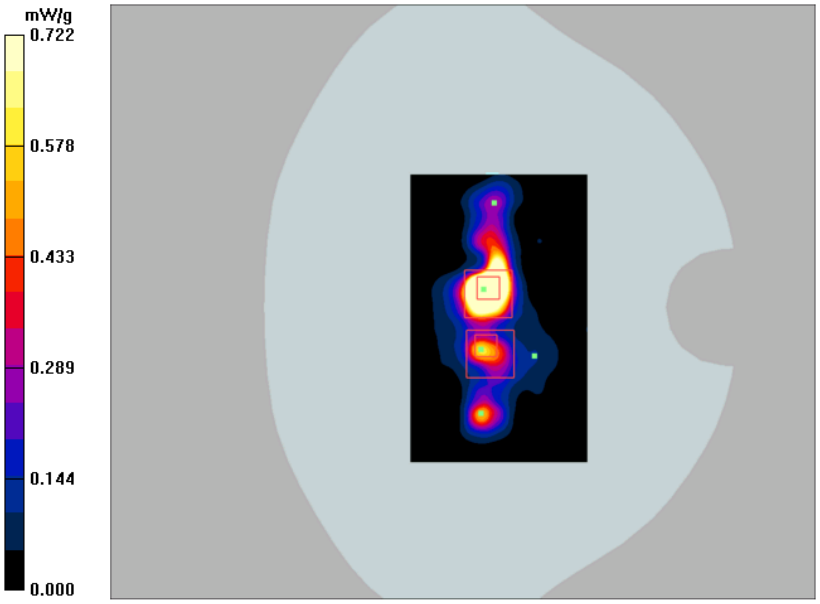
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac20; Frequency: 5240 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5240 MHz; σ = 5.1 mho/m; ε_r = 47.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.05 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.14 V/m; Power Drift = 1.38 dB
Peak SAR (extrapolated) = 6.97 W/kg
SAR(1 g) = 1.42 mW/g; SAR(10 g) = 0.337 mW/g
Maximum value of SAR (measured) = 3.03 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.14 V/m; Power Drift = 1.38 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.317 mW/g; SAR(10 g) = 0.082 mW/g
Maximum value of SAR (measured) = 0.722 mW/g



#8

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -n40 (Channel 38 5190 MHz)

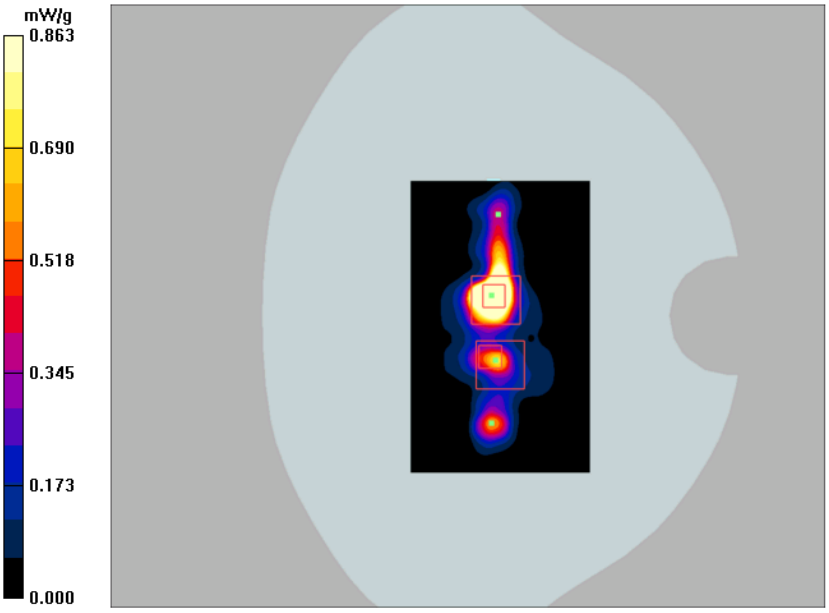
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11n40; Frequency: 5190 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5190 MHz; σ = 5.1 mho/m; ε_r = 47.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.02 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 10.1 V/m; Power Drift = 0.911 dB
Peak SAR (extrapolated) = 5.74 W/kg
SAR(1 g) = 1.45 mW/g; SAR(10 g) = 0.347 mW/g
Maximum value of SAR (measured) = 2.82 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 10.1 V/m; Power Drift = 0.911 dB
Peak SAR (extrapolated) = 1.93 W/kg
SAR(1 g) = 0.365 mW/g; SAR(10 g) = 0.086 mW/g
Maximum value of SAR (measured) = 0.863 mW/g



#9

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac40 (Channel 38 5190 MHz)

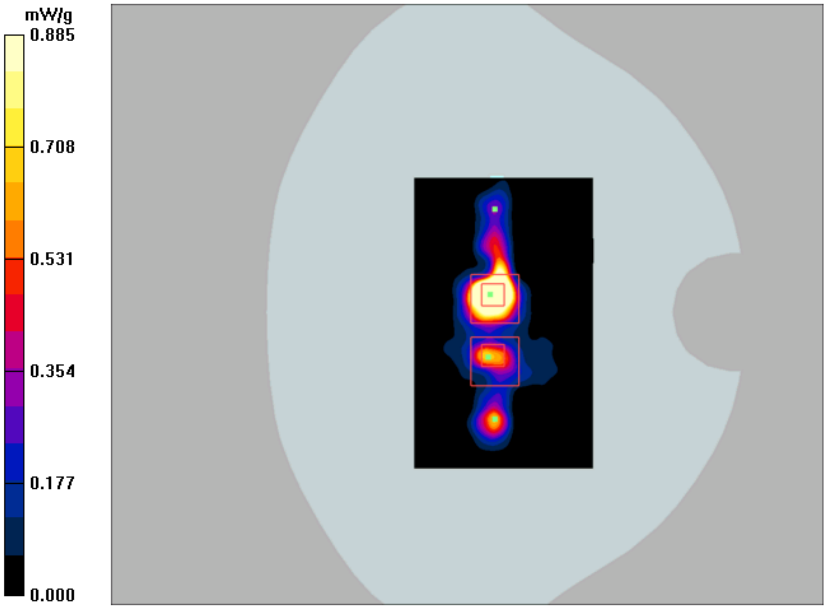
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac40; Frequency: 5190 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5190 MHz; σ = 5.1 mho/m; ε_r = 47.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.01 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.75 V/m; Power Drift = 1.30 dB
Peak SAR (extrapolated) = 6.51 W/kg
SAR(1 g) = 1.41 mW/g; SAR(10 g) = 0.335 mW/g
Maximum value of SAR (measured) = 2.87 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.75 V/m; Power Drift = 1.30 dB
Peak SAR (extrapolated) = 1.93 W/kg
SAR(1 g) = 0.396 mW/g; SAR(10 g) = 0.092 mW/g
Maximum value of SAR (measured) = 0.885 mW/g



#10

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac80 (Channel 42 5210 MHz)

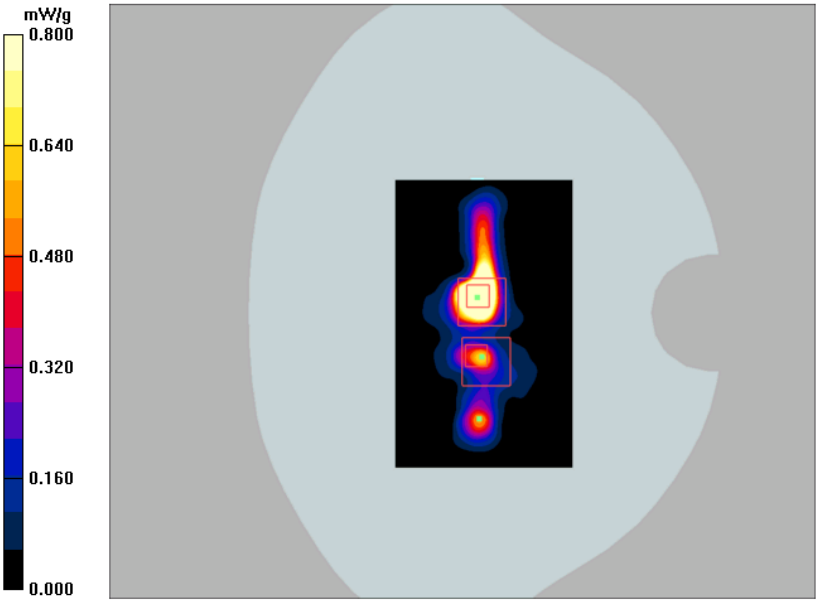
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac80; Frequency: 5210 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5210 MHz; σ = 5.09 mho/m; ε_r = 47.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.84 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 11.6 V/m; Power Drift = 0.445 dB
Peak SAR (extrapolated) = 5.69 W/kg
SAR(1 g) = 1.34 mW/g; SAR(10 g) = 0.312 mW/g
Maximum value of SAR (measured) = 2.66 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 11.6 V/m; Power Drift = 0.445 dB
Peak SAR (extrapolated) = 1.85 W/kg
SAR(1 g) = 0.341 mW/g; SAR(10 g) = 0.080 mW/g
Maximum value of SAR (measured) = 0.800 mW/g



#11

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -a Ant 1 (Channel 64 5320 MHz)

DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11a; Frequency: 5320 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5320 MHz; σ = 5.2 mho/m; ε_r = 47.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

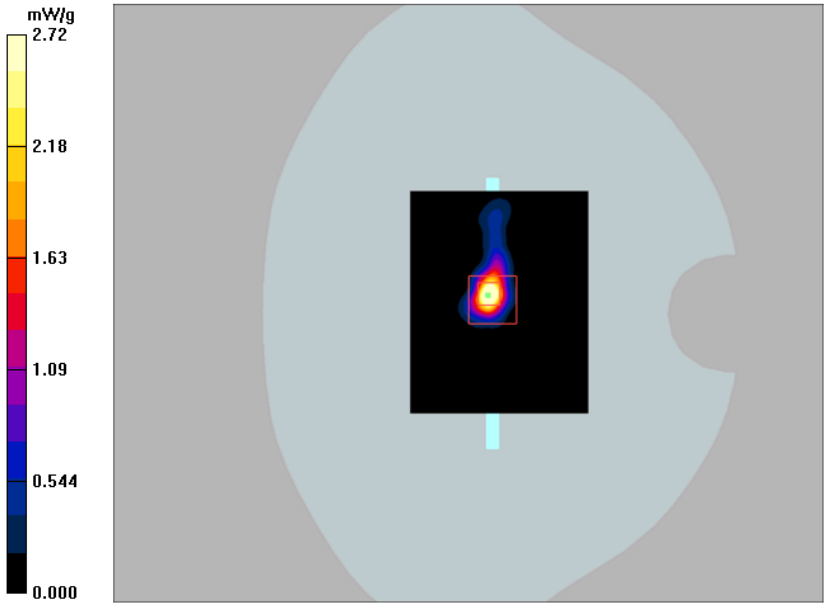
DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.72 mW/g

Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.70 V/m; Power Drift = 0.075 dB
Peak SAR (extrapolated) = 5.91 W/kg

SAR(1 g) = 1.35 mW/g; SAR(10 g) = 0.317 mW/g
Maximum value of SAR (measured) = 2.72 mW/g



#12

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -n20 (Channel 52 5260 MHz)

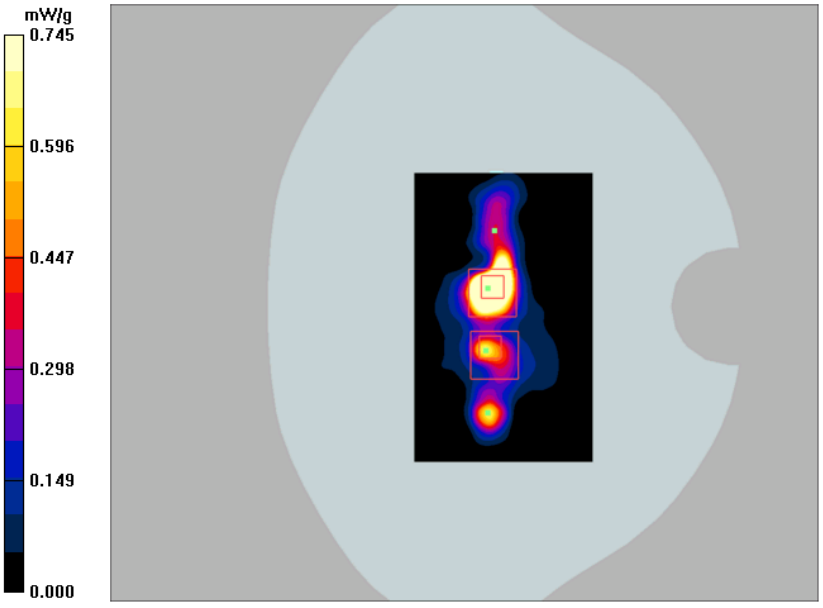
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11n20; Frequency: 5260 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5260 MHz; σ = 5.12 mho/m; ε_r = 47.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.94 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.91 V/m; Power Drift = 1.58 dB
Peak SAR (extrapolated) = 6.92 W/kg
SAR(1 g) = 1.36 mW/g; SAR(10 g) = 0.324 mW/g
Maximum value of SAR (measured) = 2.90 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.91 V/m; Power Drift = 1.58 dB
Peak SAR (extrapolated) = 1.49 W/kg
SAR(1 g) = 0.336 mW/g; SAR(10 g) = 0.089 mW/g
Maximum value of SAR (measured) = 0.745 mW/g



#13

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac20 (Channel 52 5260 MHz)

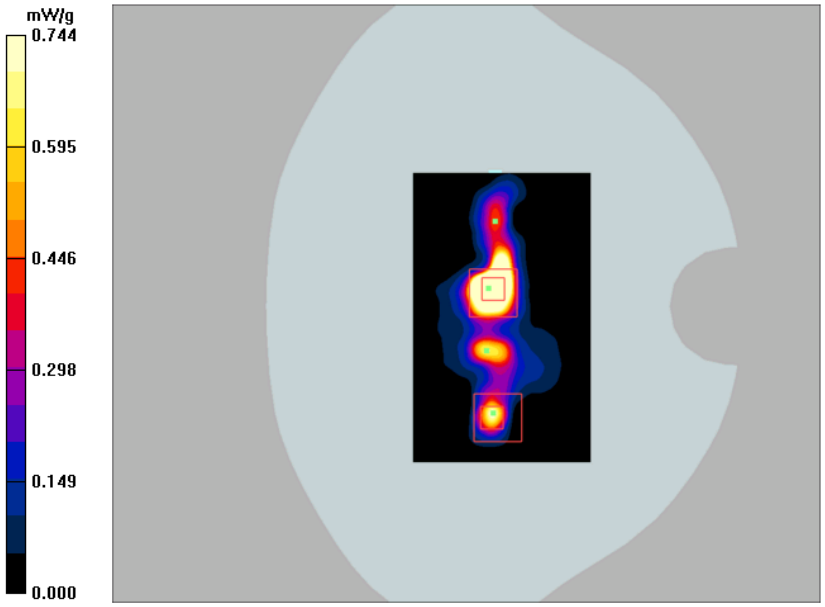
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac20; Frequency: 5260 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5260 MHz; σ = 5.12 mho/m; ε_r = 47.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.86 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 10.4 V/m; Power Drift = 0.533 dB
Peak SAR (extrapolated) = 6.27 W/kg
SAR(1 g) = 1.35 mW/g; SAR(10 g) = 0.324 mW/g
Maximum value of SAR (measured) = 2.80 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 10.4 V/m; Power Drift = 0.533 dB
Peak SAR (extrapolated) = 1.45 W/kg
SAR(1 g) = 0.319 mW/g; SAR(10 g) = 0.073 mW/g
Maximum value of SAR (measured) = 0.744 mW/g



#14

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -n40 (Channel 62 5310 MHz)

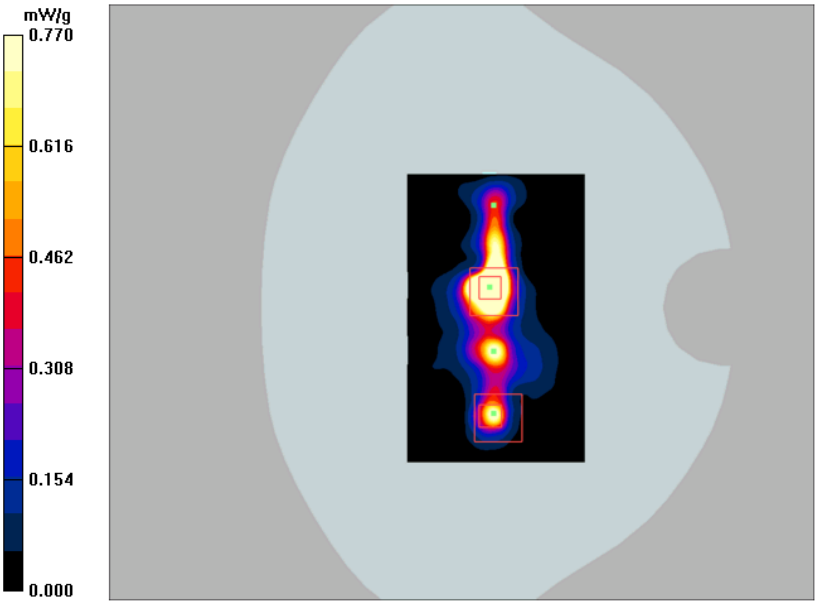
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11n40; Frequency: 5310 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5310 MHz; σ = 5.19 mho/m; ε_r = 47.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.13 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.96 V/m; Power Drift = 0.771 dB
Peak SAR (extrapolated) = 5.40 W/kg
SAR(1 g) = 1.4 mW/g; SAR(10 g) = 0.336 mW/g
Maximum value of SAR (measured) = 2.77 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.96 V/m; Power Drift = 0.771 dB
Peak SAR (extrapolated) = 1.78 W/kg
SAR(1 g) = 0.347 mW/g; SAR(10 g) = 0.079 mW/g
Maximum value of SAR (measured) = 0.770 mW/g



#15

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac40 (Channel 54 5270 MHz)

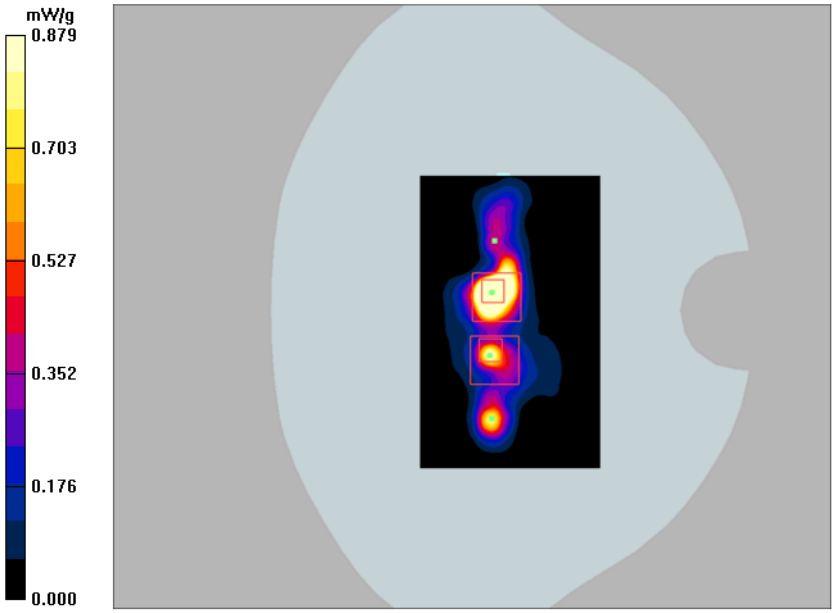
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac40; Frequency: 5270 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5270 MHz; σ = 5.16 mho/m; ε_r = 47.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.09 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.02 V/m; Power Drift = -0.058 dB
Peak SAR (extrapolated) = 5.66 W/kg
SAR(1 g) = 1.38 mW/g; SAR(10 g) = 0.326 mW/g
Maximum value of SAR (measured) = 2.86 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.02 V/m; Power Drift = -0.058 dB
Peak SAR (extrapolated) = 1.68 W/kg
SAR(1 g) = 0.396 mW/g; SAR(10 g) = 0.102 mW/g
Maximum value of SAR (measured) = 0.879 mW/g



#16

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac80 (Channel 58 5290 MHz)

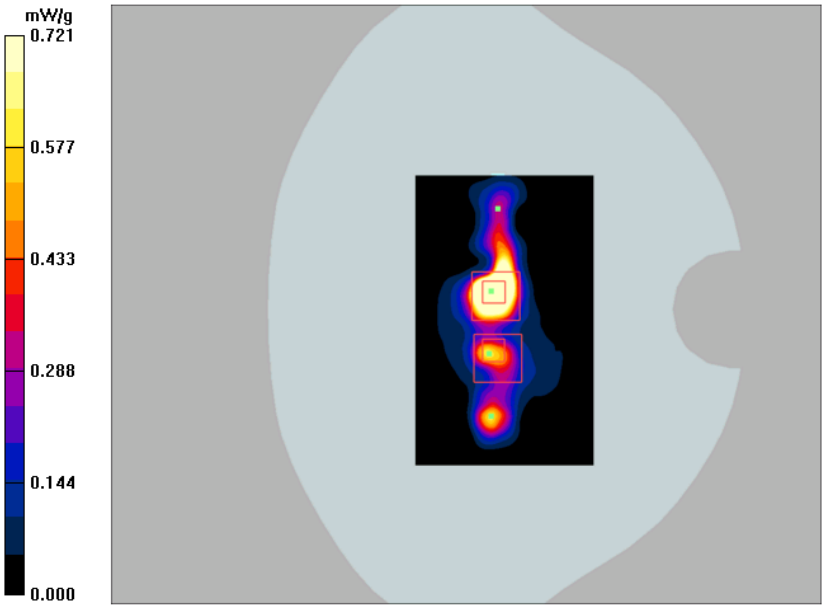
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac80; Frequency: 5290 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5290 MHz; σ = 5.15 mho/m; ε_r = 47.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.8, 3.8, 3.8); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.68 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.19 V/m; Power Drift = 1.07 dB
Peak SAR (extrapolated) = 6.23 W/kg
SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.302 mW/g
Maximum value of SAR (measured) = 2.69 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 9.19 V/m; Power Drift = 1.07 dB
Peak SAR (extrapolated) = 1.50 W/kg
SAR(1 g) = 0.333 mW/g; SAR(10 g) = 0.084 mW/g
Maximum value of SAR (measured) = 0.721 mW/g



#17

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -a Ant 1 (Channel 116 5580 MHz)

DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11a; Frequency: 5580 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5580 MHz; σ = 5.57 mho/m; ε_r = 46.61; ρ = 1000 kg/m^3
Phantom section: Flat Section

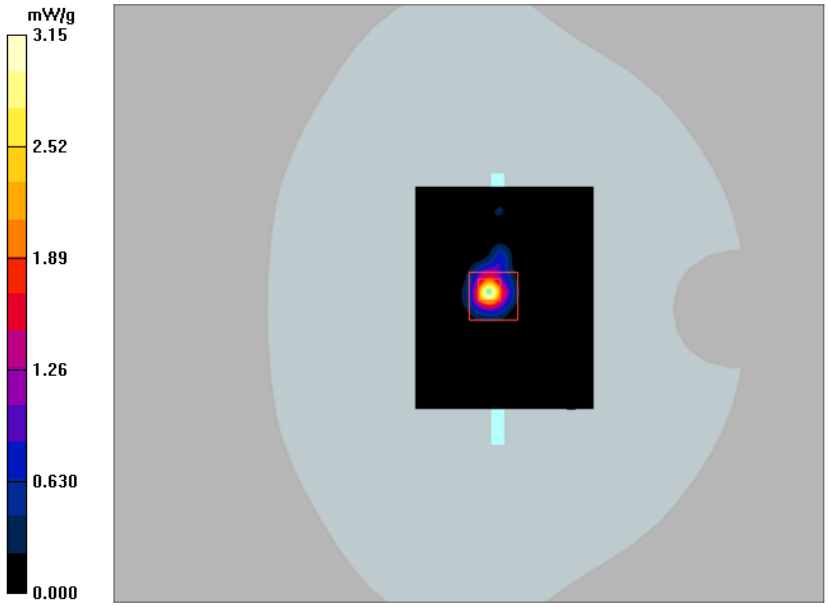
DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.23, 3.23, 3.23); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.27 mW/g

Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 6.30 V/m; Power Drift = 0.060 dB
Peak SAR (extrapolated) = 6.31 W/kg

SAR(1 g) = 1.43 mW/g; SAR(10 g) = 0.305 mW/g
Maximum value of SAR (measured) = 3.15 mW/g



#18

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -n20 (Channel 140 5700 MHz)

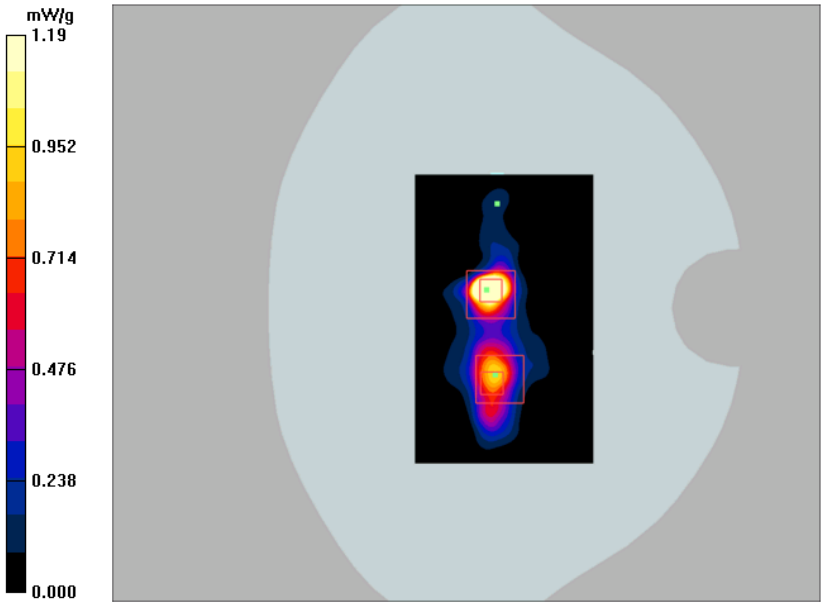
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11n20; Frequency: 5700 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5700 MHz; σ = 5.77 mho/m; ε_r = 46.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.23, 3.23, 3.23); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.18 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 7.15 V/m; Power Drift = 1.23 dB
Peak SAR (extrapolated) = 7.92 W/kg
SAR(1 g) = 1.38 mW/g; SAR(10 g) = 0.293 mW/g
Maximum value of SAR (measured) = 3.22 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 7.15 V/m; Power Drift = 1.23 dB
Peak SAR (extrapolated) = 2.41 W/kg
SAR(1 g) = 0.513 mW/g; SAR(10 g) = 0.137 mW/g
Maximum value of SAR (measured) = 1.19 mW/g



#19

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac20 (Channel 100 5500 MHz)

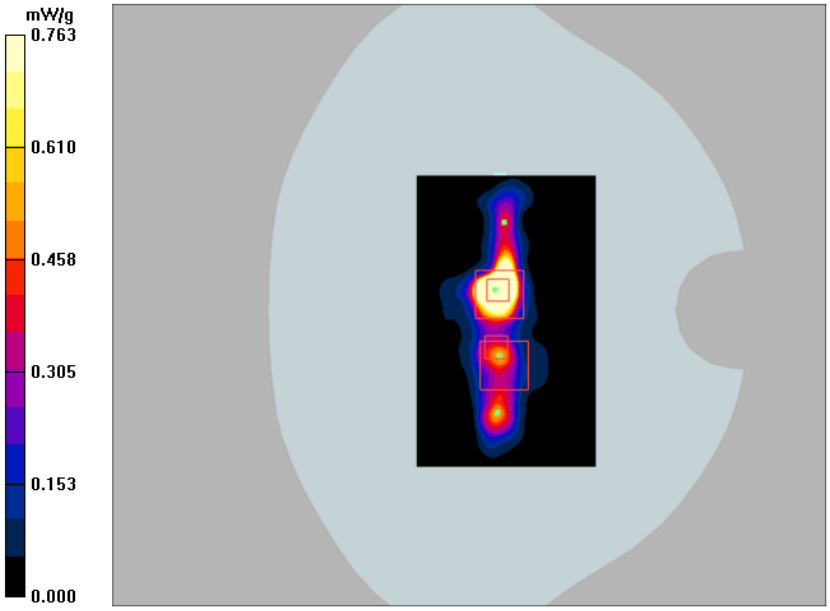
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac20; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5500 MHz; σ = 5.49 mho/m; ε_r = 46.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.23, 3.23, 3.23); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.08 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.70 V/m; Power Drift = 0.808 dB
Peak SAR (extrapolated) = 6.09 W/kg
SAR(1 g) = 1.35 mW/g; SAR(10 g) = 0.306 mW/g
Maximum value of SAR (measured) = 2.71 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.70 V/m; Power Drift = 0.808 dB
Peak SAR (extrapolated) = 2.00 W/kg
SAR(1 g) = 0.317 mW/g; SAR(10 g) = 0.076 mW/g
Maximum value of SAR (measured) = 0.763 mW/g



#20

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -n40 (Channel 110 5550 MHz)

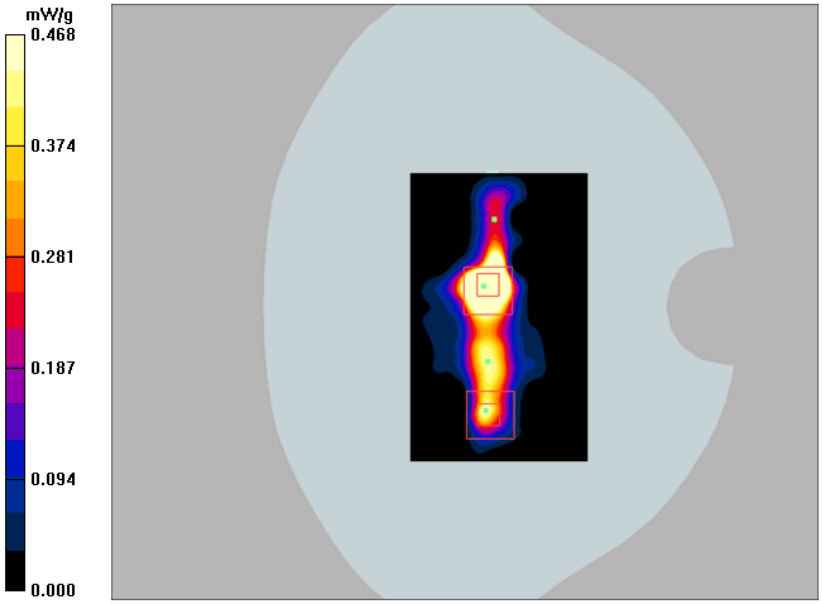
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11n40; Frequency: 5550 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5550 MHz; σ = 5.56 mho/m; ε_r = 46.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.23, 3.23, 3.23); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.10 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 7.20 V/m; Power Drift = 1.35 dB
Peak SAR (extrapolated) = 7.26 W/kg
SAR(1 g) = 1.42 mW/g; SAR(10 g) = 0.308 mW/g
Maximum value of SAR (measured) = 3.21 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 7.20 V/m; Power Drift = 1.35 dB
Peak SAR (extrapolated) = 0.963 W/kg
SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.055 mW/g
Maximum value of SAR (measured) = 0.468 mW/g



#21

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac40 (Channel 102 5510 MHz)

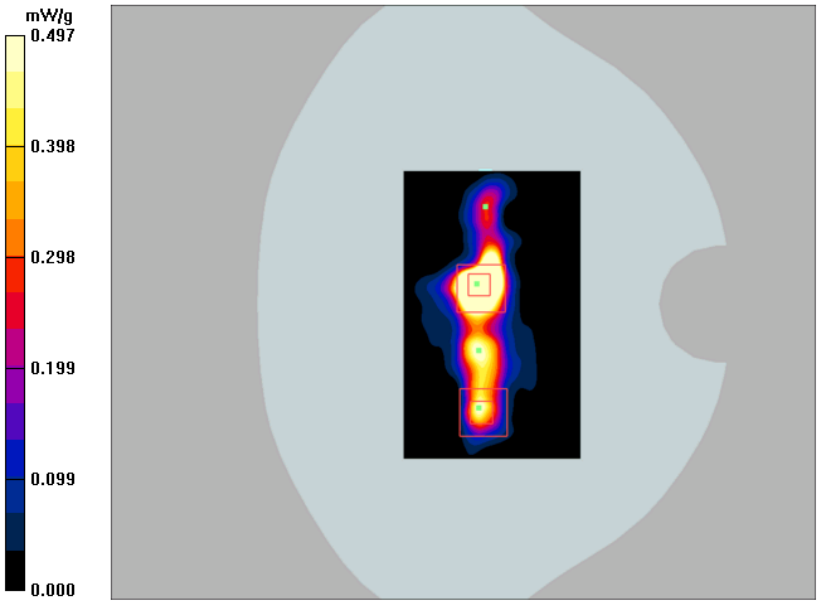
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac40; Frequency: 5510 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5510 MHz; σ = 5.49 mho/m; ε_r = 46.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.23, 3.23, 3.23); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.19 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 7.57 V/m; Power Drift = 1.40 dB
Peak SAR (extrapolated) = 7.09 W/kg
SAR(1 g) = 1.44 mW/g; SAR(10 g) = 0.317 mW/g
Maximum value of SAR (measured) = 3.07 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 7.57 V/m; Power Drift = 1.40 dB
Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.220 mW/g; SAR(10 g) = 0.055 mW/g
Maximum value of SAR (measured) = 0.497 mW/g



#22

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac80 (Channel 106 5530 MHz)

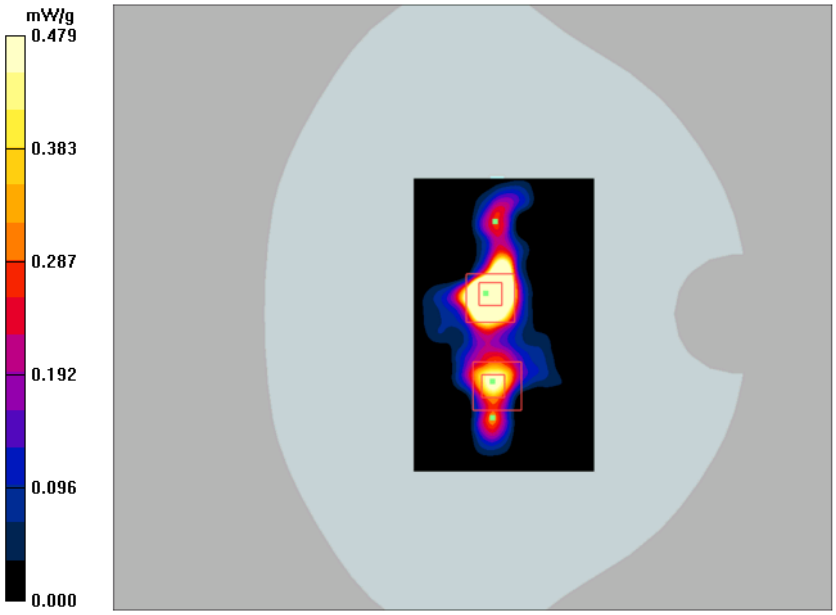
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac80; Frequency: 5530 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5530 MHz; σ = 5.6 mho/m; ε_r = 46.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.23, 3.23, 3.23); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.49 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.63 V/m; Power Drift = 0.107 dB
Peak SAR (extrapolated) = 7.42 W/kg
SAR(1 g) = 1.44 mW/g; SAR(10 g) = 0.318 mW/g
Maximum value of SAR (measured) = 3.26 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.63 V/m; Power Drift = 0.107 dB
Peak SAR (extrapolated) = 0.864 W/kg
SAR(1 g) = 0.224 mW/g; SAR(10 g) = 0.065 mW/g
Maximum value of SAR (measured) = 0.479 mW/g



#23

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -a Ant 0 (Channel 157 5785 MHz)

DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11a; Frequency: 5785 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5785 MHz; σ = 5.9 mho/m; ε_r = 46.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

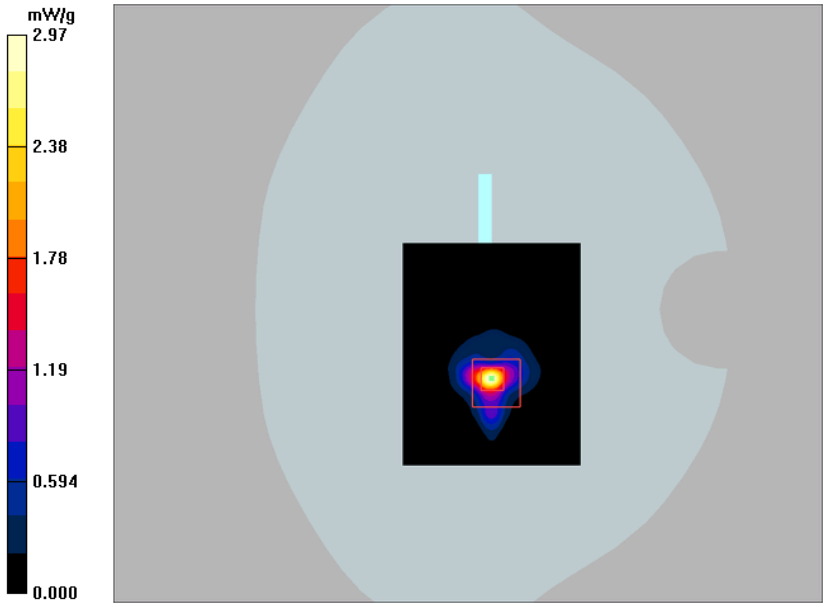
DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.54, 3.54, 3.54); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.98 mW/g

Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0.000 V/m; Power Drift = 999.0 dB
Peak SAR (extrapolated) = 6.19 W/kg

SAR(1 g) = 1.41 mW/g; SAR(10 g) = 0.338 mW/g
Maximum value of SAR (measured) = 2.97 mW/g



Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -n20 (Channel 157 5785 MHz)

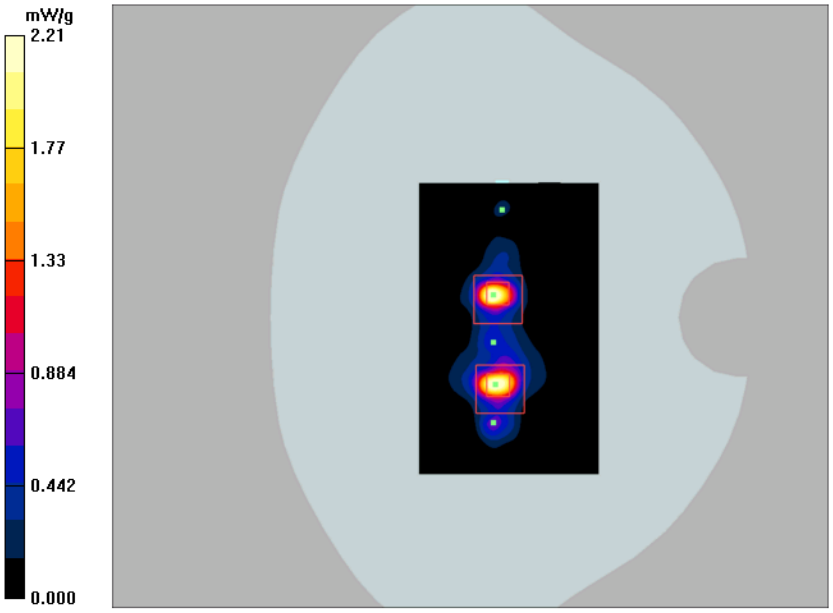
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11n20; Frequency: 5785 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5785 MHz; σ = 5.9 mho/m; ε_r = 46.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.54, 3.54, 3.54); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.51 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 6.46 V/m; Power Drift = 0.305 dB
Peak SAR (extrapolated) = 7.04 W/kg
SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.270 mW/g
Maximum value of SAR (measured) = 2.81 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 6.46 V/m; Power Drift = 0.305 dB
Peak SAR (extrapolated) = 4.32 W/kg
SAR(1 g) = 1.05 mW/g; SAR(10 g) = 0.267 mW/g
Maximum value of SAR (measured) = 2.21 mW/g



#25

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac20 (Channel 149 5745 MHz)

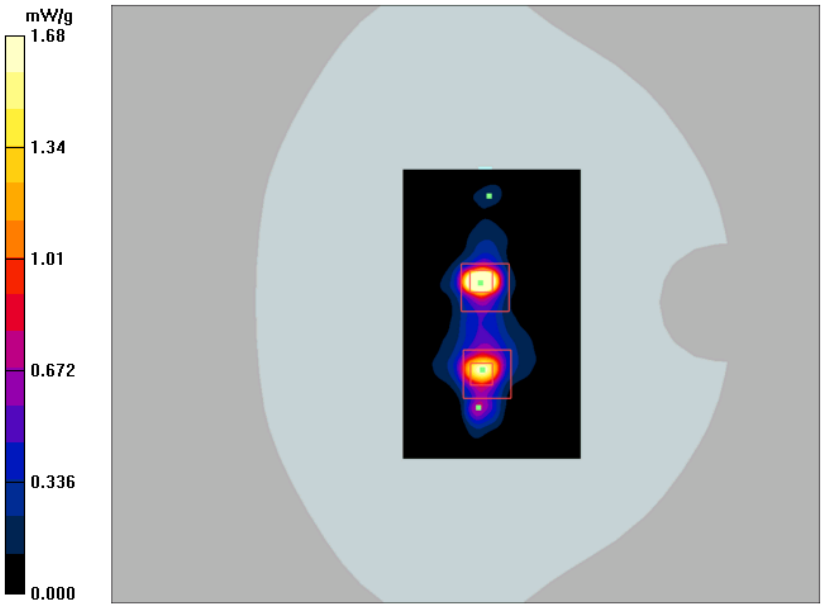
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac20; Frequency: 5745 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5745 MHz; σ = 5.82 mho/m; ε_r = 46.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.54, 3.54, 3.54); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.72 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 7.03 V/m; Power Drift = 1.46 dB
Peak SAR (extrapolated) = 6.70 W/kg
SAR(1 g) = 1.37 mW/g; SAR(10 g) = 0.293 mW/g
Maximum value of SAR (measured) = 2.98 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 7.03 V/m; Power Drift = 1.46 dB
Peak SAR (extrapolated) = 3.35 W/kg
SAR(1 g) = 0.739 mW/g; SAR(10 g) = 0.193 mW/g
Maximum value of SAR (measured) = 1.68 mW/g



#26

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -n40 (Channel 151 5755 MHz)

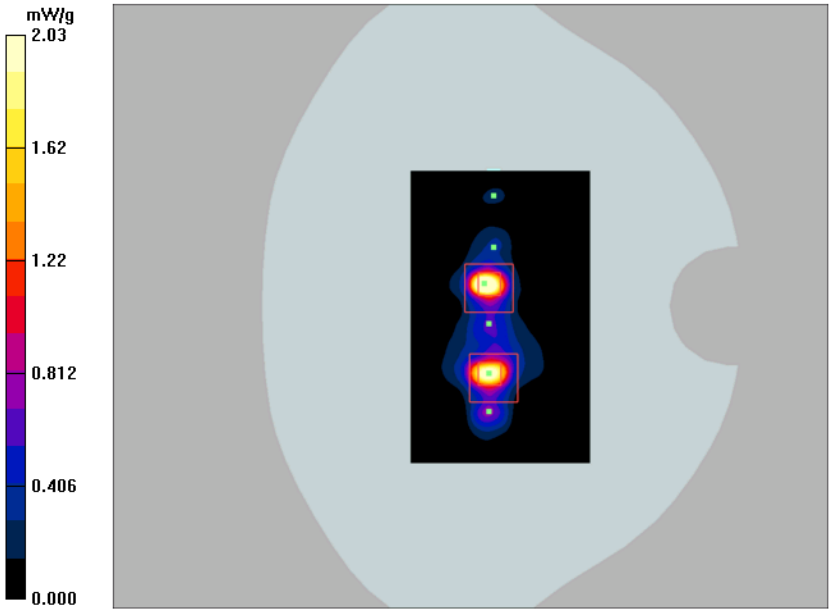
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11n40; Frequency: 5755 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5755 MHz; σ = 5.81 mho/m; ε_r = 46.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.54, 3.54, 3.54); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.70 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 6.58 V/m; Power Drift = 1.01 dB
Peak SAR (extrapolated) = 6.66 W/kg
SAR(1 g) = 1.3 mW/g; SAR(10 g) = 0.287 mW/g
Maximum value of SAR (measured) = 2.92 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 6.58 V/m; Power Drift = 1.01 dB
Peak SAR (extrapolated) = 4.23 W/kg
SAR(1 g) = 0.949 mW/g; SAR(10 g) = 0.249 mW/g
Maximum value of SAR (measured) = 2.03 mW/g



#27

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac40 (Channel 151 5755 MHz)

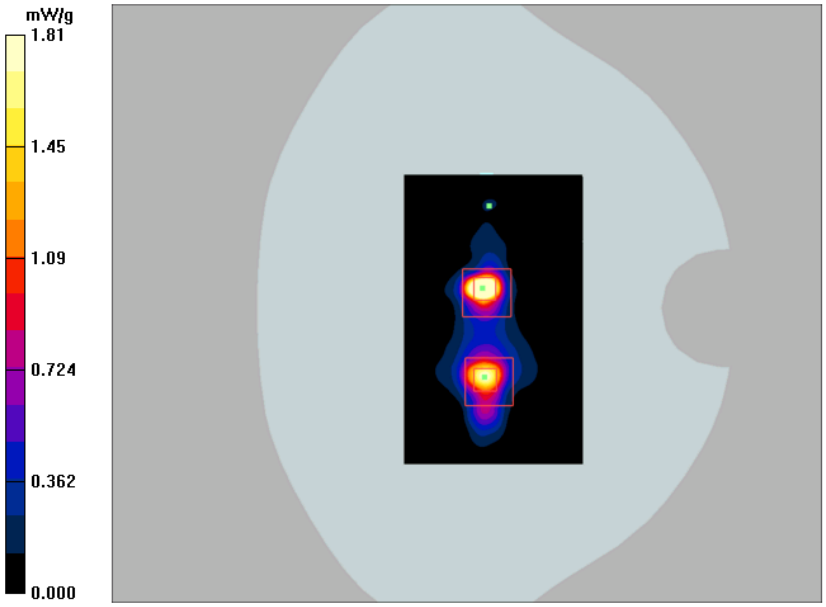
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac40; Frequency: 5755 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5755 MHz; σ = 5.81 mho/m; ε_r = 46.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.54, 3.54, 3.54); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.85 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.25 V/m; Power Drift = 1.03 dB
Peak SAR (extrapolated) = 6.98 W/kg
SAR(1 g) = 1.38 mW/g; SAR(10 g) = 0.302 mW/g
Maximum value of SAR (measured) = 2.89 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 8.25 V/m; Power Drift = 1.03 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 0.859 mW/g; SAR(10 g) = 0.226 mW/g
Maximum value of SAR (measured) = 1.81 mW/g



#28

Test Laboratory: Bay Area Compliance Lab Corp.(BACL)

Top Touch to the Phantom -ac80 (Channel 155 5775 MHz)

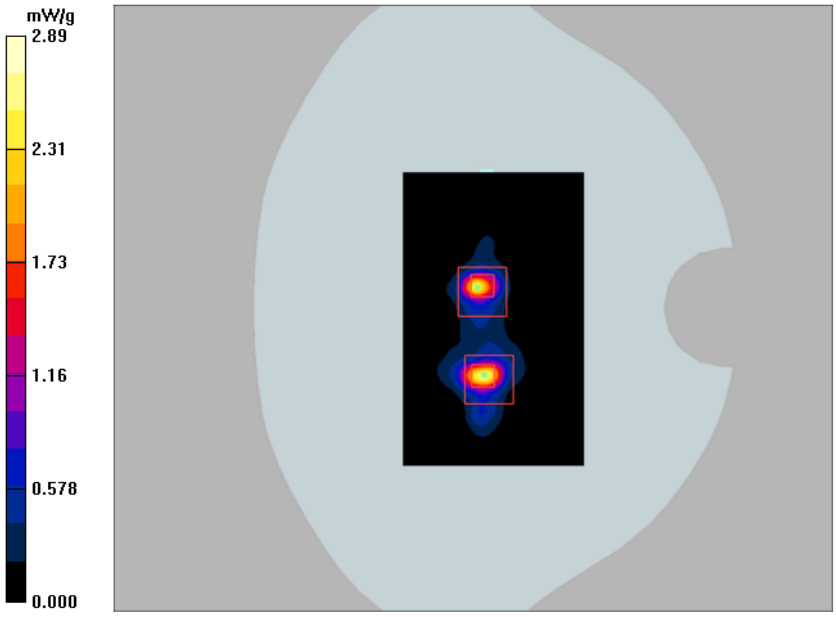
DUT: Nvidia; Type: Tablet; Serial: 0424515000201

Communication System: 802.11ac80; Frequency: 5775 MHz; Duty Cycle: 1:1
Medium parameters used: f = 5775 MHz; σ = 5.87 mho/m; ε_r = 46.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3619; ConvF(3.54, 3.54, 3.54); Calibrated: 10/20/2015
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn530; Calibrated: 8/18/2015
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 186

Top Side Touch to the Phantom/Area Scan (81x131x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.65 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 6.60 V/m; Power Drift = -0.507 dB
Peak SAR (extrapolated) = 5.10 W/kg
SAR(1 g) = 1.11 mW/g; SAR(10 g) = 0.271 mW/g
Maximum value of SAR (measured) = 2.36 mW/g
Top Side Touch to the Phantom/Zoom Scan (7x7x13)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 6.60 V/m; Power Drift = -0.507 dB
Peak SAR (extrapolated) = 6.21 W/kg
SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.266 mW/g
Maximum value of SAR (measured) = 2.89 mW/g



#29

16 Appendix F- RF Output Power Measurement

RF Output Power Measurement Results

2.4 GHz WLAN:

Modulation	Frequency (MHz)	Output Average Power Conducted (dBm)			
		TX Chain 0		TX Chain 1	
		Measured	Target	Measured	Target
2.4 GHz 802.11b	2412	16.84	**17**	16.84	**17**
	2437	16.62	**17**	16.11	**17**
	2452	17.26	**17**	-	-
	2457	15.19	15	-	-
	2462	13.64	13.5	-	-
	2467	12.89	12.5	16.04	**17**
	2472	13.84	13.5	13.67	13.5
2.4 GHz 802.11g	2412	16.28	**16**	15.55	**16**
	2437	16.15	**16**	15.7	**16**
	2457	16.65	**16**	15.95	**16**
	2462	15.92	15.5	14.31	15.5
	2467	13.66	13.5	10.86	10.5
	2472	11.14	10.5	10.87	10.5
2.4 GHz 802.11n HT20	2412	14.83	14	14.27	14
	2417	16.25	**16**	15.7	**16**
	2437	16.09	**16**	15.77	**16**
	2457	15.83	**16**	16.12	**16**
	2462	13.68	13	12.05	12
	2467	11.51	10.5	10.63	10.5
	2472	8.78	8	8.31	8
2.4 GHz 802.11n HT40	2422	13.62	12	12.33	12
	2437	14.89	14	14.25	14
	2462	12.19	12	10.4	10

2.4 GHz Bluetooth:

Modulation	Frequency (MHz)	Output Average Power Conducted (dBm)	
		TX Chain 0	
		Measured	Target
BT-GFSK	2402	7.66	7.5
	2441	10.74	10.5
	2480	10	10
BT- DQPSK	2402	6.08	6
	2441	8.58	8.5
	2480	8.02	8
BT-8DPSK	2402	6.54	6.5
	2441	9.06	9
	2480	8.39	8.5
BT-BLE	2402	4.12	4
	2440	6.57	6.5
	2480	5.99	6

5 GHz WLAN:

Modulation	Frequency (MHz)	Output Average Power Conducted (dBm)			
		TX Chain 0		TX Chain 1	
		Measured	Target	Measured	Target
5 GHz 802.11a	5180	11.33	11.5	10.9	11
	5220	12.19	12	10.89	11
	5240	11.92	12	10.92	11
	5260	11.8	12	10.61	10.5
	5300	12.29	12.5	10.79	11
	5320	12.43	12.5	10.8	11
	5500	10.15	10	10.21	10
	5580	10.4	10.5	9.55	9.5
	5700	12.87	13	11.26	11
	5745	13.5	13.5	11.67	12
	5785	12.94	13	12.01	12.5
	5825	11.66	12	12.83	12.5
5 GHz 802.11n HT20	5180	10.24	11	10.9	11
	5220	11.03	11	10.91	11
	5240	10.98	11	10.85	10.5
	5260	11.53	11.5	10.29	10.5
	5300	12.37	12.5	10.65	10.5
	5320	12.32	12.5	10.96	11
	5500	9.83	10.5	10.36	10.5
	5580	9.45	9.5	9.4	9.5
	5700	12.76	12.5	11.14	11
	5745	13.5	13.5	11.83	12
	5785	13.08	13	12.08	12.5
	5825	11.58	12	11.43	12
5 GHz 802.11 ac20	5180	10.32	11	10.92	11
	5220	10.86	11	10.96	11
	5240	10.86	11	10.45	10.5
	5260	11.51	11.5	10.4	10.5
	5300	12.39	12.5	10.92	10.5
	5320	12.39	12.5	11.02	11
	5500	9.79	10.5	10.31	10.5
	5580	9.32	9.5	9.5	9.5
	5700	12.7	12.5	11.22	11
	5745	13.46	13.5	11.9	12
	5785	13.06	13	12.16	12.5
	5825	11.45	12	11.4	12

Modulation	Frequency (MHz)	Output Average Power Conducted (dBm)			
		TX Chain 0		TX Chain 1	
		Measured	Target	Measured	Target
5 GHz 802.11n HT40	5190	10.29	10.5	10.85	10.5
	5230	11.04	11	10.96	11
	5270	12.01	12	11.01	11
	5310	12.75	12.5	10.86	11
	5510	10.01	10.5	10.68	10.5
	5550	9.3	10	10	10
	5670	10.4	10.5	9.2	10
	5755	13.5	13.5	12.14	12.5
	5795	12.03	12	11.65	12
5 GHz 802.11 ac40	5190	10.34	10.5	10.96	10.5
	5230	11	11	11.02	11
	5270	12.08	12	10.82	11
	5310	12.66	12.5	11.2	11
	5510	10.06	10.5	10.6	10.5
	5550	9.43	10	10.22	10
	5670	10.45	10.5	9.2	10
	5755	13.5	13.5	12.32	12.5
	5795	12.05	12	11.34	12
5 GHz 802.11 ac80	5210	10.6	11	10.71	11
	5290	12.2	12	10.64	10.5
	5530	9.27	10	10.01	10
	5610*	9.91	10	9.41	10
	5775	13.1	13	12.08	12.5

Note: channel used for FCC only.*