SAR Test Report

Product Name	:	Smart Phone
Model No.	:	FTU152B, Smart HD
FCC ID	:	2AG5L-FTU152B

Applicant	:	Plus one marketing Ltd.
Address	:	Sumitomofudosan Hibiya building 2F, 2-8-6Shinbashi, Minatoku, Tokyo, Japan

Date of Receipt	:	Mar. 07, 2016
Date of Test	:	Mar. 07, 2016
Issued Date	:	Mar. 21, 2016
Report No.	:	1632053R-HP-US-P03V01
Report Version	:	V1.1

Note: The report is only for 5G WIFI SAR according to the requirement of the manufacturer

Test Report Certification

Issued Date: Mar. 21, 2016
Report No.: 1632053R-HP-US-P03V01

Product Name	:	Smart Phone
Applicant	:	Plus one marketing Ltd.
Address	:	Sumitomofudosan Hibiya building 2F, 2-8-6Shinbashi, Minatoku, Tokyo, Japan
Manufacturer	:	Shenzhen X&F Technology Co., Ltd.
Address	:	6/F North Tower of Wandelai Duilding, No.29 of Kejinan 6th Avenue, Hi-tech Industrial Park, Nanshan District,Shenzhen,China
Model No.	:	FTU152B, Smart HD
FCC ID	:	2AG5L-FTU152B
EUT Voltage	:	DC 3.7V
Brand Name	:	OWN, Freetel
Applicable Standard	:	IEEE Std. 1528-2013, 47CFR § 2.1093 FCC KDB Publication 248227 D01v02r02 FCC KDB Publication 447498 D01v06 FCC KDB Publication 648474 D04v01r02 FCC KDB Publication 865664 D01v01r03 FCC KDB Publication 941225 D06v02r01
Test Result	:	Max. SAR Measurement (1g) Head: **1.186** W/kg; Body: **0.682** W/kg
Performed Location	:	Quietek Corporation - Suzhou EMC Laboratory No.99 Hongye Rd., Suzhou Industrial Park, Suzhou, 215006, Jiangsu, China TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098 FCC Registration Number: 800392; IC Lab Code: 4075B
Documented By	:	Alice Ni
Reviewed By	:	Frank he
Approved By	:	Harry zhao

Laboratory Information

We, **QuieTek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	**:**	**BSMI, NCC, TAF**
USA	**:**	**FCC**
Japan	**:**	**VCCI**
China	**:**	**CNAS**

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : http://www.quietek.com/english/about/certificates.aspx?bval=5
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/index_en.aspx
If you have any comments, Please don't hesitate to contact us. Our contact information is as below:

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1632053R-HP-US-P03V01	V1.0	Initial Issued Report	Mar. 16, 2016
1632053R-HP-US-P03V01	V1.1	(1) Delete BT information (2) Modify EUT Antenna Locations diagram exhibited (3) remove simultaneous transmission part (4) Modify a few power	Mar. 21, 2016

1. General Information

1.1. EUT Description

Product Name	Smart Phone
Model No.	FTU152B, Smart HD
Device Category	Portable
RF Exposure Environment	Uncontrolled
Antenna Type	Internal
WIFI	
Frequency	5150MHz~5250MHz;5725MHz~5825MHz(802.11a/802.11n(H20)/802.11n(H40))
Type of modulation	802.11a/n: OFDM
Data Rate	802.11a: 54 Mbps 802.11n: up to 150 Mbps
Antenna Gain	-3dBi

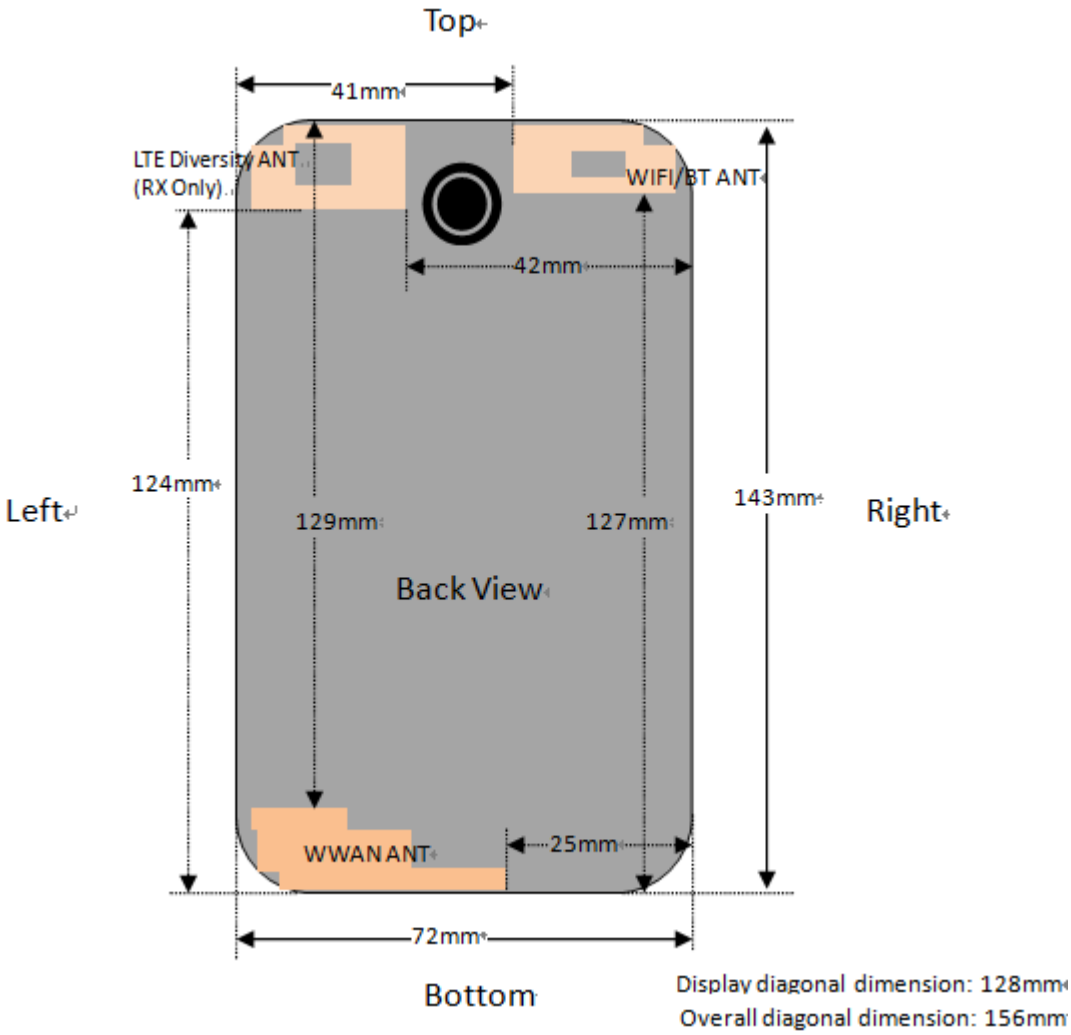
Note: The different models are for different markets.

1.2. Test Environment

Ambient conditions in the laboratory:

Items	Required	Actual
Temperature (°C)	18-25	21.5± 2
Humidity (%RH)	30-70	52

1.3. EUT Antenna Locations



Mobile Hotspot Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
WIFI	Yes	Yes	Yes	No	Yes	No

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v02r01 guidance, page 2. The antenna photo shows the distances between the transmit antennas and the edges of the device.

1.4. SAR Test Exclusions Applied

Licensed Transmitter(s)

GSM/GPRS DTM is not supported for US bands. Therefore, the GSM Voice modes in this report do not transmit simultaneously with GPRS Data.

When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.

1.5. Power Reduction for SAR

There is no power reduction used for any band/mode implemented in this device for SAR purposes.

1.6. Max Power Reduction for SAR

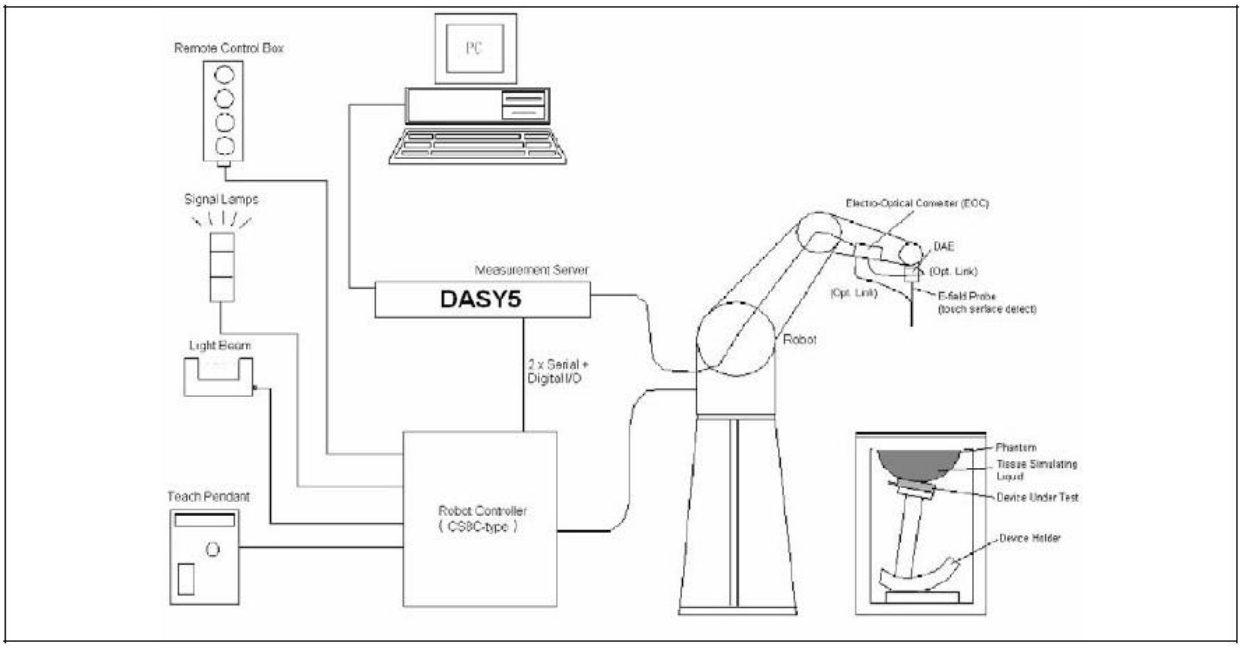
MPR is not supported.

1.7. Guidance Documents

1) FCC KDB Publication 941225 D06v02r01 (Hotspot)
2) FCC KDB Publication 447498 D01v06(General SAR Guidance)
3) FCC KDB Publication 865664 D01v01r03(SAR measurement 100 MHz to 6 GHz)
4) FCC KDB Publication 648474 D04v01r02(SAR Evaluation Considerations for Wireless Handsets)
5) FCC KDB Publication 248227 D01v02r02(SAR measurements for devices incorporating IEEE 802.11 wireless transmitters.)

2. SAR Measurement System

2.1. DASY5 System Description



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

- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- 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 from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

2.1.1. Applications

Predefined procedures and evaluations for automated compliance testing with all worldwide standards, e.g., IEEE 1528, IEC 62209-1, IEC 62209-2, EN 50360, EN 50383 and others.

2.1.2. Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 10mm² step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

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 1528-2013 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan).

2.1.3. Zoom Scan (Cube Scan Averaging)

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. A density of 1000 kg/m³ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications utilize a physical step of 7x7x7 (5mmx5mmx5mm) providing a volume of 30mm in the X & Y axis, and 30mm in the Z axis.

2.1.4. Uncertainty of Inter-/Extrapolation and Averaging

In order to evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Postprocessor, DASY5 allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEEE 1528.The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x,y,z) = Ae^{-\frac{z}{2a}}\cos^2\left(\frac{\pi}{2}\frac{\sqrt{x'^2+y'^2}}{5a}\right)$$

$$f_2(x,y,z) = Ae^{-\frac{z}{a}}\frac{a^2}{a^2+x'^2}\left(3-e^{-\frac{2z}{a}}\right)\cos^2\left(\frac{\pi}{2}\frac{y'}{3a}\right)$$

$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4}+x'^2+y'^2}\left(e^{-\frac{2z}{a}}+\frac{a^2}{2(a+2z)^2}\right)$$

2.2. DASY5 E-Field Probe

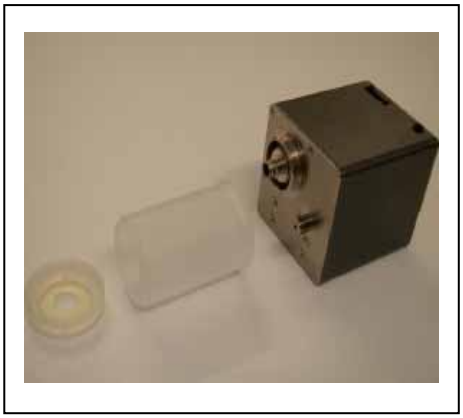
The SAR measurement is conducted with the dosimetric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.
SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN 62209-1, IEC 62209, etc.) under ISO 17025. The calibration data are in Appendix D.

2.2.1. Isotropic E-Field Probe Specification

Model	EX3DV4	
Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 µW/g to 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)	
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	
Application	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.	

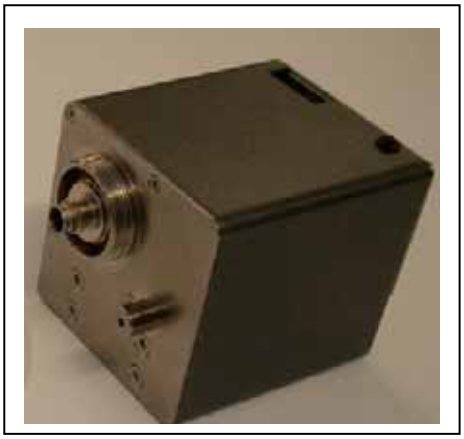
2.3. Boundary Detection Unit and Probe Mounting Device

The DASY5 probes use a precise connector and an additional holder for the probe, consisting of a plastic tube and a flexible silicon ring to center the probe. The connector at the DAE is flexibly mounted and held in the default position with magnets and springs. Two switching systems in the connector mount detect frontal and lateral probe collisions and trigger the necessary software response.



2.4. DATA Acquisition Electronics (DAE) and Measurement Server

The data acquisition electronics (DAE) 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.
The input impedance of the DAE4 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.



The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chipdisk and 128MB RAM. The necessary circuits for communication with the DAE electronics box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.

2.5. Robot

The DASY5 system uses the high precision robots TX90 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY5 system, the CS8C robot controller version from Stäubli is used.
The XL robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

2.6. 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, such 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.

2.7. Device Holder

The DASY5 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 center for both scales is the ear reference point (EPR).
Thus the device needs no repositioning when changing the angles.
The DASY5 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity εr =3 and loss tangent δ = 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.

2.8. 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 head
- Right head
- Flat phantom

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. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

3. Tissue Simulating Liquid

3.1. The composition of the tissue simulating liquid

INGREDIENT (% Weight)	5200MHz Head	5200MHz Body	5800MHz Head	5800MHz Body
Water	65.53	75.68	65.53	75.68
Salt	0.00	0.43	0.00	0.43
Sugar	0.00	0.00	0.00	0.00
HEC	0.00	0.00	0.00	0.00
Preventol	0.00	0.00	0.00	0.00
DGBE	17.24	4.42	17.24	4.42
Triton X-100	17.24	19.47	17.24	19.47

3.2. Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using DASY5 Dielectric Probe Kit and Agilent Vector Network Analyzer E5071C

Head Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ε_r	σ [s/m]	
5200MHz	Reference result ± 5% window	36.0 34.20 to 37.80	4.66 4.43 to 4.89	N/A
	03-07-2016	36.94	4.60	21.0
5800MHz	Reference result ± 5% window	35.3 33.54 to 37.06	5.07 4.82 to 5.32	N/A
	03-07-2016	34.16	5.15	21.0

Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ε_r	σ [s/m]	
5200MHz	Reference result ± 5% window	49.0 46.55 to 51.45	5.30 5.04 to 5.57	N/A
	03-07-2016	49.54	5.25	21.0
5800MHz	Reference result ± 5% window	48.2 45.79 to 50.61	6.00 5.70 to 6.30	N/A
	03-07-2016	47.90	6.10	21.0

3.3. Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

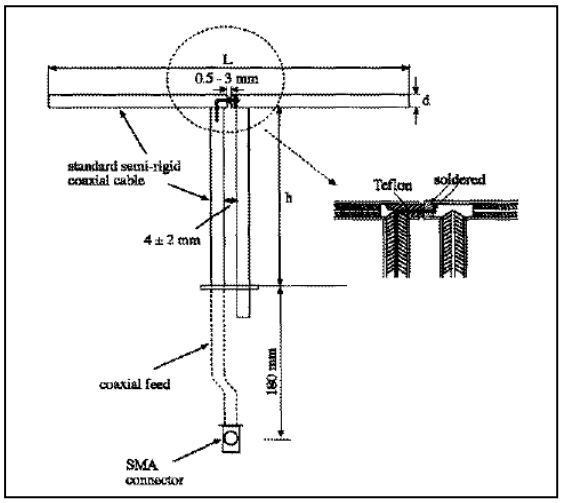
Target Frequency	Head		Body	
(MHz)	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
2600	39.0	1.96	52.5	2.16
3000	38.5	2.40	52.0	2.73
5800	**35.3**	**5.27**	**48.2**	**6.00**

(ε_r = relative permittivity, σ = conductivity and ρ = 1000 kg/m^3)

4. SAR Measurement Procedure

4.1. SAR System Validation

4.1.1. Validation Dipoles



The dipoles used is based on the IEEE-1528 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. the table below provides details for the mechanical and electrical specifications for the dipoles.

Frequency	L (mm)	h (mm)	d (mm)
5800MHz	20.6	14.2	3.6

4.1.2. Validation Result

System Performance Check at 5200MHz and 5800MHz for Head.

Validation Dipole: D5200V2, SN: 1203

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
5200 MHz	Reference result ± 10% window	78.4 70.56 to 86.24	22.4 20.16 to 24.64	N/A
	03-07-2016	83.2	24.0	21.0

Validation Dipole: D5800V2, SN: 1203

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
5800 MHz	Reference result ± 10% window	76.0 68.40 to 83.60	21.2 19.08 to 23.32	N/A
	03-07-2016	81.4	22.8	21.0

Note: All SAR values are normalized to 1W forward power.

System Performance Check at 5200MHz and 5800MHz for Body

Validation Dipole: D5200V2, SN: 1203

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
5200 MHz	Reference result ± 10% window	80.7 72.63 to 88.77	22.8 20.52 to 25.08	N/A
	03-07-2016	74.2	21.4	21.0

Validation Dipole: D5800V2, SN: 1203

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
5800 MHz	Reference result ± 10% window	76.6 68.94 to 84.26	21.1 18.99 to 23.21	N/A
	03-07-2016	73.4	20.5	21.0

Note: All SAR values are normalized to 1W forward power.

4.2. SAR Measurement Procedure

The DASY5 calculates SAR using the following equation,

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

σ: represents the simulated tissue conductivity
ρ: represents the tissue density

The EUT is set to transmit at the required power in line with product specification, at each frequency relating to the LOW, MID, and HIGH channel settings.

Pre-scans are made on the device to establish the location for the transmitting antenna, using a large area scan in either air or tissue simulation fluid.

The EUT is placed against the Universal Phantom where the maximum area scan dimensions are larger than the physical size of the resonating antenna. When the scan size is not large enough to cover the peak SAR distribution, it is modified by either extending the area scan size in both the X and Y directions, or the device is shifted within the predefined area.

The area scan is then run to establish the peak SAR location (interpolated resolution set at 1mm²) which is then used to orient the center of the zoom scan. The zoom scan is then executed and the 1g and 10g averages are derived from the zoom scan volume (interpolated resolution set at 1mm³).

4.3. Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. Per FCC KDB Publication 648474 D04 v01r02, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01 v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. 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 is tested.

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person’s face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

4.4. Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of Wi-Fi simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v01r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the Wi-Fi transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the Wi-Fi transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

5. SAR Exposure Limits

SAR assessments have been made in line with the requirements of IEEE-1528, FCC Supplement C, and comply with ANSI/IEEE C95.1-1992 “Uncontrolled Environments” limits. These limits apply to a location which is deemed as “Uncontrolled Environment” which can be described as a situation where the general public may be exposed to an RF source with no prior knowledge or control over their exposure.

Limits for General Population/Uncontrolled Exposure (W/kg)

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (1g cube tissue for brain or body)	1.60 W/kg
Spatial Average SAR (whole body)	0.08 W/kg
Spatial Peak SAR (10g for hands, feet, ankles and wrist)	4.00 W/kg

6. Test Equipment List

Instrument	Manufacturer	Model No.	Serial No.	Cali. Due Date
Stäubli Robot TX60L	Stäubli	TX60L	F10/5C90A1/A/01	N/A
Controller	Stäubli	SP1	S-0034	N/A
Dipole Validation Kits	Speag	D5GHzV2	1203	2016.12.14
SAM Twin Phantom	Speag	SAM	TP-1561/1562	N/A
Device Holder	Speag	SD 000 H01 HA	N/A	N/A
Data Acquisition Electronic	Speag	DAE4	910	2016.06.15
E-Field Probe	Speag	EX3DV4	3753	2016.04.10
SAR Software	Speag	DASY5	V5.2 Build 162	N/A
Power Amplifier	Mini-Circuit	ZVA-183-S+	N657400950	N/A
Directional Coupler	Agilent	778D	20160	N/A
Universal Radio Communication Tester	R&S	CMU 200	117088	2017.03.10
Vector Network	Agilent	E5071C	MY48367267	2017.03.10
Signal Generator	Agilent	E4438C	MY49070163	2017.03.10
Power Meter	Anritsu	ML2495A	0905006	2016.10.29
Wide Bandwidth Sensor	Anritsu	MA2411B	0846014	2016.10.29

7. Measurement Uncertainty

DASY5 Uncertainty Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram / 10 gram.								
Error Description	Uncert. value	Prob. Dist.	Div.	(ci) 1g	(ci) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(vi) Veff
Measurement System								
Probe Calibration	±6.0%	N	1	1	1	±6.0%	±6.0%	∞
Axial Isotropy	±4.7%	R	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	√3	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	√3	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	√3	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	√3	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	√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%	±3.6%	5
Power Drift	±5.0%	R	√3	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	√3	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0%	R	√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	√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						±11.0%	±10.8%	387
Expanded STD Uncertainty						±22.0%	±21.5%	

DASY5 Uncertainty

Measurement uncertainty for 3 GHz to 6 GHz averaged over 1 gram / 10 gram.

Error Description	Uncert. value	Prob. Dist.	Div.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.55%	N	1	1	1	±6.55%	±6.55%	∞
Axial Isotropy	±4.7%	R	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±2.0%	R	√3	1	1	±1.2%	±1.2%	∞
Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	√3	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	√3	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.8%	R	√3	1	1	±0.5%	±0.5%	∞
Probe Positioning	±9.9%	R	√3	1	1	±5.7%	±5.7%	∞
Max. SAR Eval.	±4.0%	R	√3	1	1	±2.3%	±2.3%	∞
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%	±3.6%	5
Power Drift	±5.0%	R	√3	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	√3	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0%	R	√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	√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						±12.8%	±12.6%	330
Expanded STD Uncertainty						±25.6%	±25.2%	

8. Conducted Power Measurement

WIFI Power

Test Mode	Frequency (MHz)	Avg. Output Power (dBm)	Max. Power (dBm)	Scaling Factor
802.11a	5180	14.35	14.5	1.035
	5200	14.14	14.5	1.086
	5220	13.98	14.0	1.005
	5240	13.81	14.0	1.045
	5745	14.04	14.5	1.112
	5765	13.92	14.0	1.019
	5785	14.17	14.5	1.079
	5805	13.97	14.0	1.007
	5825	13.94	14.0	1.014
802.11n(20MHz)	5180	13.93	14.0	1.016
	5200	14.09	14.5	1.099
	5220	14.05	14.5	1.109
	5240	14.31	14.5	1.045
	5745	14.06	14.5	1.107
	5765	14.03	14.5	1.114
	5785	14.16	14.5	1.081
	5805	13.95	14.0	1.012
	5825	13.92	14.0	1.019
802.11n(40MHz)	5190	14.14	14.5	1.086
	5230	14.10	14.5	1.096
	5755	13.84	14.0	1.038
	5795	13.44	14.0	1.138

9. Test Results

9.1. SAR Test Results Summary

SAR MEASUREMENT									
Ambient Temperature (°C) : 21.5 ± 2				Relative Humidity (%): 52					
Liquid Temperature (°C) : 21.0 ± 2				Depth of Liquid (cm):>15					
Product: Smart Phone									
Test Mode: 802.11a 5.2G									
Test Position Head	Antenna Position	Frequency		Frame Power (dBm)	Power Drift (<±0.2)	SAR 1g (W/kg)	Scaling Factor	Scaled SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz						
Left-Cheek	Fixed	36	5180	14.35	0.01	0.586	1.035	0.607	1.6
Left-Tilted	Fixed	36	5180	14.35	0.19	0.573	1.035	0.593	1.6
Right-Cheek	Fixed	36	5180	14.35	0.08	0.776	1.035	0.803	1.6
Right-Cheek	Fixed	40	5200	14.14	0.20	0.782	1.086	0.849	1.6
Right-Tilted	Fixed	36	5180	14.35	0.01	0.828	1.035	0.857	1.6
Right-Tilted	Fixed	40	5200	14.14	0.01	0.953	1.086	1.035	1.6
Right-Tilted*	Fixed	40	5200	14.14	0.17	**0.975**	1.086	**1.059**	1.6
Note:1. All the test channels are selected according to KDB 248227 D01v02r02. 2.The maximum SAR is tested repeated according to KDB 865664 D01v01r03.									

SAR MEASUREMENT

Ambient Temperature (°C) : 21.5 ± 2	Relative Humidity (%): 52
Liquid Temperature (°C) : 21.0 ± 2	Depth of Liquid (cm):>15
Product: Smart Phone	
Test Mode: 802.11a 5.2G	

Test Position Head	Antenna Position	Frequency		Conducted Power (dBm)	Scaled SAR 1g (W/kg)	Duty cycle (%)	Duty factor	Duty Cycle Scaled SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz						
Left-Cheek	Fixed	36	5180	14.35	0.607	89.6	1.12	0.680	1.6
Left-Tilted	Fixed	36	5180	14.35	0.593	89.6	1.12	0.664	1.6
Right-Cheek	Fixed	36	5180	14.35	0.803	89.6	1.12	0.899	1.6
Right-Cheek	Fixed	40	5200	14.14	0.849	89.6	1.12	0.951	1.6
Right-Tilted	Fixed	36	5180	14.35	0.857	89.6	1.12	0.960	1.6
Right-Tilted	Fixed	40	5200	14.14	1.035	89.6	1.12	1.159	1.6
Right-Tilted*	Fixed	40	5200	14.14	**1.059**	89.6	1.12	**1.186**	1.6

Note 1: SAR need to be scaled to the maximum tune-up power according to KDB 447498D01v06.

Note 2: The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit according to KDB 248227D01v02r02.

SAR MEASUREMENT									
Ambient Temperature (°C): 21.5 ± 2				Relative Humidity (%): 52					
Liquid Temperature (°C): 21.0 ± 2				Depth of Liquid (cm):>15					
Product: Smart Phone									
Body-worn Accessory SAR Configurations									
Test Mode: 802.11a 5.2G									
Test Position Body (10mm gap)	Antenna Position	Frequency		Conducted Power (dBm)	Power Drift (<±0.2)	SAR 1g (W/kg)	Scaling Factor	Scaled SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz						
Body-worn	Fixed	36	5180	14.35	0.09	0.279	1.035	0.289	1.6
Hotspot SAR Configurations									
Test Mode: 802.11a 5.2G									
Back	Fixed	36	5180	14.35	0.09	0.279	1.035	0.289	1.6
Front	Fixed	36	5180	14.35	0.18	0.271	1.035	0.280	1.6
Right side	Fixed	36	5180	14.35	-0.01	0.460	1.035	0.476	1.6
Top	Fixed	36	5180	14.35	0.07	0.588	1.035	0.609	1.6
Note: All the test channels are selected according to KDB 248227 D01v02r02.									

SAR MEASUREMENT									
Ambient Temperature (°C) : 21.5 ± 2				Relative Humidity (%): 52					
Liquid Temperature (°C) : 21.0 ± 2				Depth of Liquid (cm):>15					
Product: Smart Phone									
Test Mode: 802.11a 5.2G									
Test Position Head	Antenna Position	Frequency		Conducted Power (dBm)	Scaled SAR 1g (W/kg)	Duty cycle (%)	Duty factor	Duty Cycle Scaled SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz						
Back	Fixed	36	5180	14.35	0.289	89.6	1.12	0.324	1.6
Hotspot SAR Configurations									
Test Mode: 802.11a 5.2G									
Back	Fixed	36	5180	14.35	0.289	89.6	1.12	0.324	1.6
Front	Fixed	36	5180	14.35	0.280	89.6	1.12	0.314	1.6
Right side	Fixed	36	5180	14.35	0.476	89.6	1.12	0.533	1.6
Top	Fixed	36	5180	14.35	0.609	89.6	1.12	0.682	1.6

Note 1: SAR need to be scaled to the maximum tune-up power according to KDB 447498D01v06.

Note 2: The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit according to KDB 248227D01v02r02.

SAR MEASUREMENT

Ambient Temperature (°C) : 21.5 ± 2	Relative Humidity (%): 52
Liquid Temperature (°C) : 21.0 ± 2	Depth of Liquid (cm):>15
Product: Smart Phone	
Test Mode: 802.11a 5.8G	

Test Position Head	Antenna Position	Frequency		Frame Power (dBm)	Power Drift (<±0.2)	SAR 1g (W/kg)	Scaling Factor	Scaled SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz						
Left-Cheek	Fixed	157	5785	14.17	0.16	0.131	1.079	0.141	1.6
Left-Tilted	Fixed	157	5785	14.17	0.04	0.115	1.079	0.124	1.6
Right-Cheek	Fixed	157	5785	14.17	0.17	**0.183**	1.079	**0.197**	1.6
Right-Tilted	Fixed	157	5785	14.17	0.07	0.163	1.079	0.176	1.6

Note: All the test channels are selected according to KDB 248227 D01v02r02.

SAR MEASUREMENT

Ambient Temperature (°C) : 21.5 ± 2	Relative Humidity (%): 52
Liquid Temperature (°C) : 21.0 ± 2	Depth of Liquid (cm):>15
Product: Smart Phone	
Test Mode: 802.11a 5.8G	

Test Position Head	Antenna Position	Frequency		Conducted Power (dBm)	Scaled SAR 1g (W/kg)	Duty cycle (%)	Duty factor	Duty Cycle Scaled SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz						
Left-Cheek	Fixed	157	5785	14.17	0.141	89.3	1.12	0.158	1.6
Left-Tilted	Fixed	157	5785	14.17	0.124	89.3	1.12	0.139	1.6
Right-Cheek	Fixed	157	5785	14.17	**0.197**	89.3	1.12	**0.221**	1.6
Right-Tilted	Fixed	157	5785	14.17	0.176	89.3	1.12	0.197	1.6

Note 1: SAR need to be scaled to the maximum tune-up power according to KDB 447498D01v06.

Note 2: The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit according to KDB 248227D01v02r02.

SAR MEASUREMENT									
Ambient Temperature (°C): 21.5 ± 2				Relative Humidity (%): 52					
Liquid Temperature (°C): 21.0 ± 2				Depth of Liquid (cm):>15					
Product: Smart Phone									
Body-worn Accessory SAR Configurations									
Test Mode: 802.11a 5.8G									
Test Position Body (10mm gap)	Antenna Position	Frequency		Conducted Power (dBm)	Power Drift (<±0.2)	SAR 1g (W/kg)	Scaling Factor	Scaled SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz						
Body-worn	Fixed	157	5785	14.17	-0.04	0.054	1.079	0.058	1.6
Hotspot SAR Configurations									
Test Mode: 802.11a 5.8G									
Back	Fixed	157	5785	14.17	-0.04	0.054	1.079	0.058	1.6
Front	Fixed	157	5785	14.17	0.09	0.055	1.079	0.059	1.6
Right side	Fixed	157	5785	14.17	0.17	0.017	1.079	0.018	1.6
Top	Fixed	157	5785	14.17	0.03	0.098	1.079	0.106	1.6
Note: All the test channels are selected according to KDB 248227 D01v02r02.									

SAR MEASUREMENT									
Ambient Temperature (°C) : 21.5 ± 2				Relative Humidity (%): 52					
Liquid Temperature (°C) : 21.0 ± 2				Depth of Liquid (cm):>15					
Product: Smart Phone									
Test Mode: 802.11a 5.8G									
Test Position Head	Antenna Position	Frequency		Conducted Power (dBm)	Scaled SAR 1g (W/kg)	Duty cycle (%)	Duty factor	Duty Cycle Scaled SAR 1g (W/kg)	Limit (W/kg)
		Channel	MHz						
Body-worn	Fixed	157	5785	14.17	0.058	89.3	1.12	0.065	1.6
Hotspot SAR Configurations									
Test Mode: 802.11a 5.8G									
Back	Fixed	157	5785	14.17	0.058	89.3	1.12	0.065	1.6
Front	Fixed	157	5785	14.17	0.059	89.3	1.12	0.066	1.6
Right side	Fixed	157	5785	14.17	0.018	89.3	1.12	0.020	1.6
Top	Fixed	157	5785	14.17	0.106	89.3	1.12	0.119	1.6

Note 1: SAR need to be scaled to the maximum tune-up power according to KDB 447498D01v06.

Note 2: The reported SAR must be scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit according to KDB 248227D01v02r02.

9.2. SAR Test Notes

9.2.1. Test position and configuration

Head SAR was performed with the device configured in the positions according to IEEE1528. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.

9.2.2. Body SAR with Headset

Per FCC KDB Publication 648474 D04v01r02, SAR was evaluated without a headset connected to the device. Since the standalone reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.

9.2.3. Hotspot Operation Mode

During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with Wi-Fi) was not activated.

Appendix A. SAR System Validation Data

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

System Check Head 5200MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2

Communication System: UID 0, CW; Communication System Band: 5GHz; Duty Cycle: 1:1; Frequency: 5200 MHz; Medium parameters used: f = 5200 MHz; σ = 4.60 S/m; εr = 36.94; ρ = 1000 kg/m3 ; Phantom section: Flat Section ; Input Power=100mW

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

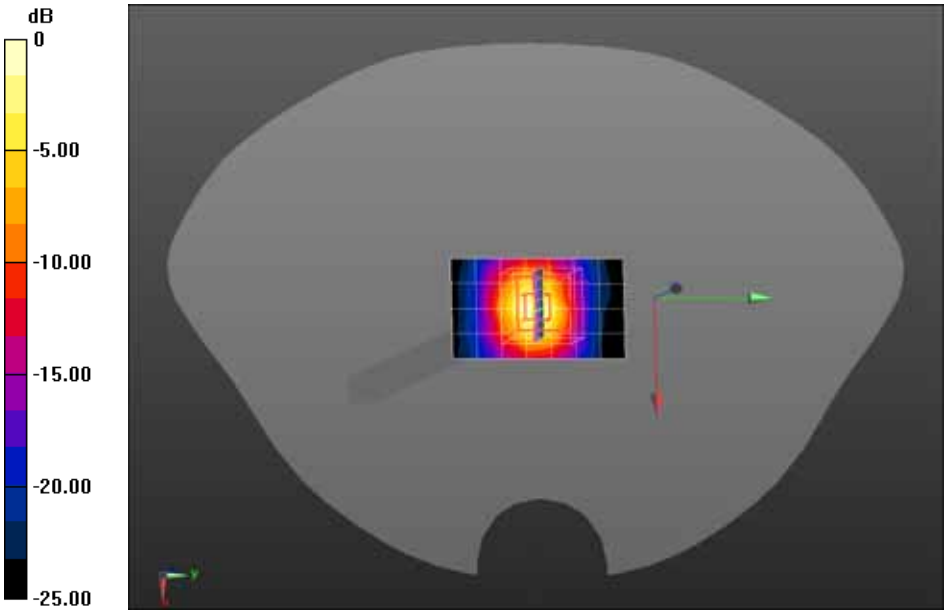
Configuration/Head 5200MHz/Area Scan (5x8x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 14.9 W/kg

Configuration/Head 5200MHz/Zoom Scan (8x8x10)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm, Reference Value = 46.523 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 33.8 W/kg

SAR(1 g) = 8.32 W/kg; SAR(10 g) = 2.40 W/kg Maximum value of SAR (measured) = 16.6 W/kg



0 dB = 16.6 W/kg = 12.48 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

System Check Body 5200MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2

Communication System: UID 0, CW; Communication System Band: 5GHz; Duty Cycle: 1:1; Frequency: 5200 MHz; Medium parameters used: f = 5200 MHz; σ = 5.25 S/m; εr = 49.54; ρ = 1000 kg/m3 ; Phantom section: Flat Section ; Input Power=100mW

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

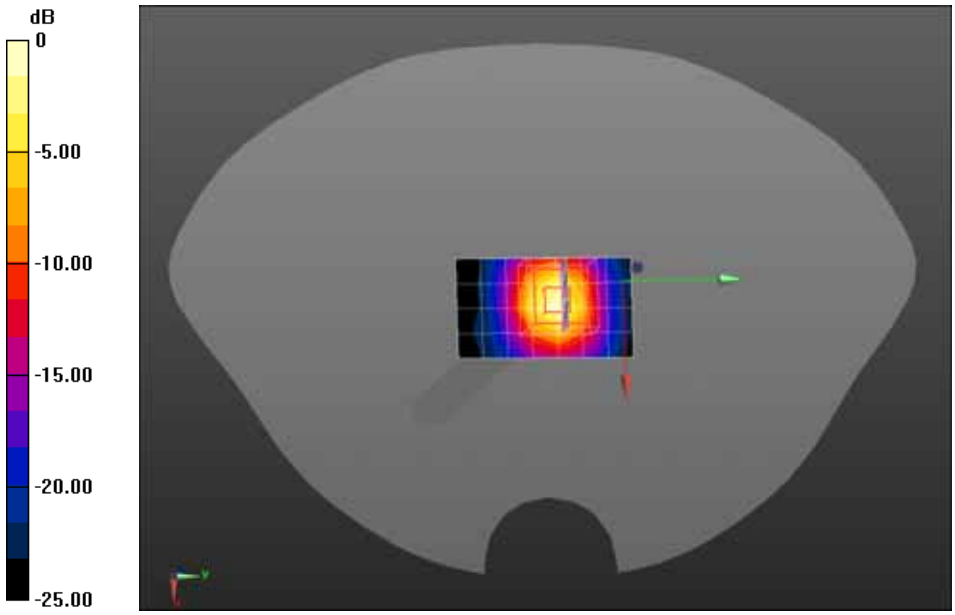
Configuration/Body 5200MHz/Area Scan (5x8x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 15.9 W/kg

Configuration/Body 5200MHz/Zoom Scan (8x8x10)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm, Reference Value = 39.824 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 31.3 W/kg

SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.28 W/kg Maximum value of SAR (measured) = 17.2 W/kg



0 dB = 17.2 W/kg = 12.59 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

System Check Head 5800MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2

Communication System: UID 0, CW; Communication System Band: 5GHz; Duty Cycle: 1:1; Frequency: 5800 MHz; Medium parameters used: f = 5800 MHz; σ = 5.15 S/m; εr = 34.16; ρ = 1000 kg/m3 ; Phantom section: Flat Section ; Input Power=100mW

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

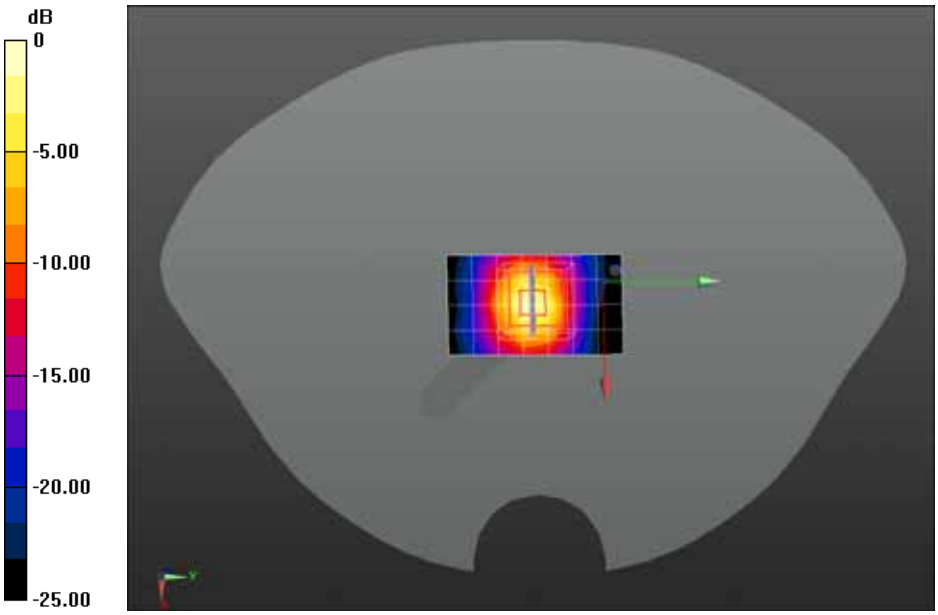
Configuration/Head 5800MHz/Area Scan (5x8x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 13.7 W/kg

Configuration/Head 5800MHz/Zoom Scan (8x8x10)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm, Reference Value = 39.225 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 31.2 W/kg

SAR(1 g) = 7.42 W/kg; SAR(10 g) = 2.14 W/kg Maximum value of SAR (measured) = 14.3 W/kg



0 dB = 14.3 W/kg = 11.88 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

System Check Body 5800MHz

DUT: Dipole D5GHzV2; Type: D5GHzV2

Communication System: UID 0, CW; Communication System Band: 5GHz; Duty Cycle: 1:1; Frequency: 5800 MHz; Medium parameters used: f = 5800 MHz; σ = 6.10 S/m; εr = 47.90; ρ = 1000 kg/m3 ; Phantom section: Flat Section ; Input Power=100mW

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

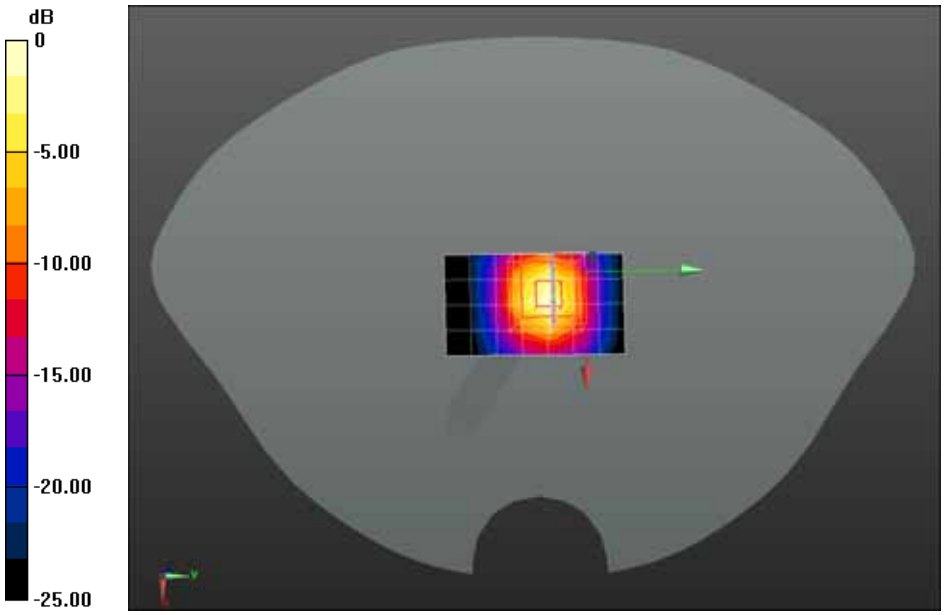
Configuration/Body 5800MHz/Area Scan (5x8x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 13.0 W/kg

Configuration/Body 5800MHz/Zoom Scan (8x8x10)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm, Reference Value = 31.216 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 30.1 W/kg

SAR(1 g) = 7.34 W/kg; SAR(10 g) = 2.05 W/kg Maximum value of SAR (measured) = 13.8 W/kg



0 dB = 13.8 W/kg = 10.98 dBW/kg

Appendix B. SAR measurement Data

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5180MHz Touch-Left

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5180 MHz; Medium parameters used: f = 5180 MHz; σ = 4.58 S/m; εr = 37.03; ρ = 1000 kg/m3 ; Phantom section: Left Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

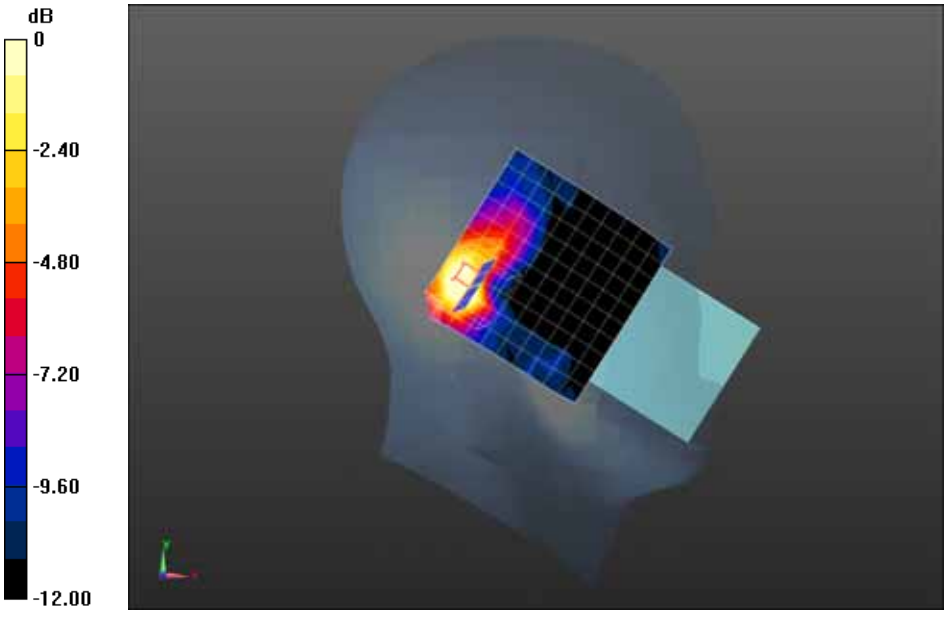
- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/802.11a 5180MHz Touch-Left/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (measured) = 1.40 W/kg

Configuration/802.11a 5180MHz Touch-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 6.532 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.63 W/kg

SAR(1 g) = 0.586 W/kg; SAR(10 g) = 0.116 Maximum value of SAR (measured) = 0.745 W/kg



0 dB = 0.745 W/kg = -1.28 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5180MHz Tilt-Left

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5180 MHz; Medium parameters used: f = 5180 MHz; σ = 4.58 S/m; εr = 37.03; ρ = 1000 kg/m3 ; Phantom section: Left Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

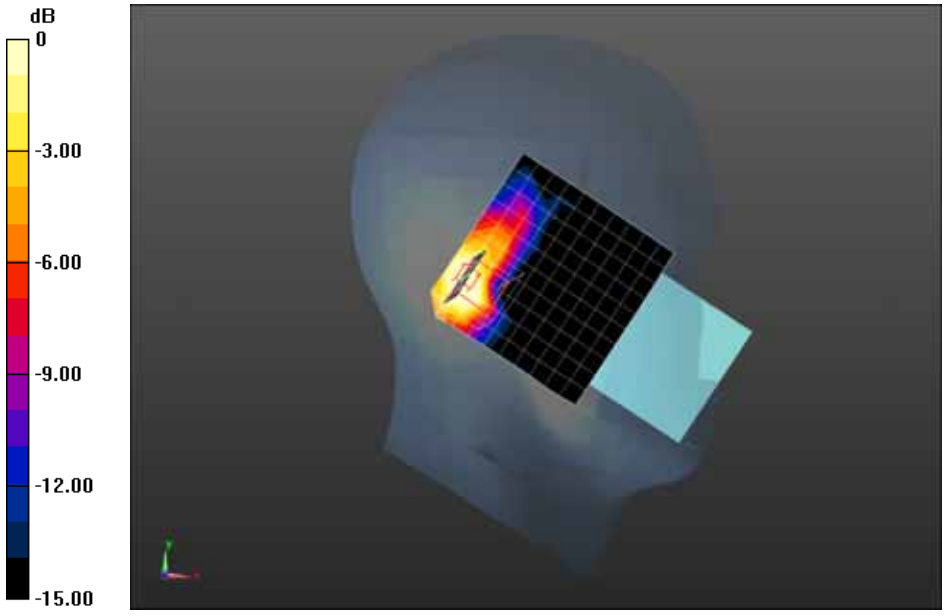
- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/802.11a 5180MHz Tilt-Left/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (measured) = 1.31 W/kg

Configuration/802.11a 5180MHz Tilt-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 3.883 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 1.67 W/kg

SAR(1 g) = 0.573 W/kg; SAR(10 g) = 0.172 W/kg Maximum value of SAR (measured) = 0.616 W/kg



0 dB = 0.616 W/kg = -2.10 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5180MHz Touch-Right

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5180 MHz; Medium parameters used: f = 5180 MHz; σ = 4.58 S/m; εr = 37.03; ρ = 1000 kg/m3 ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

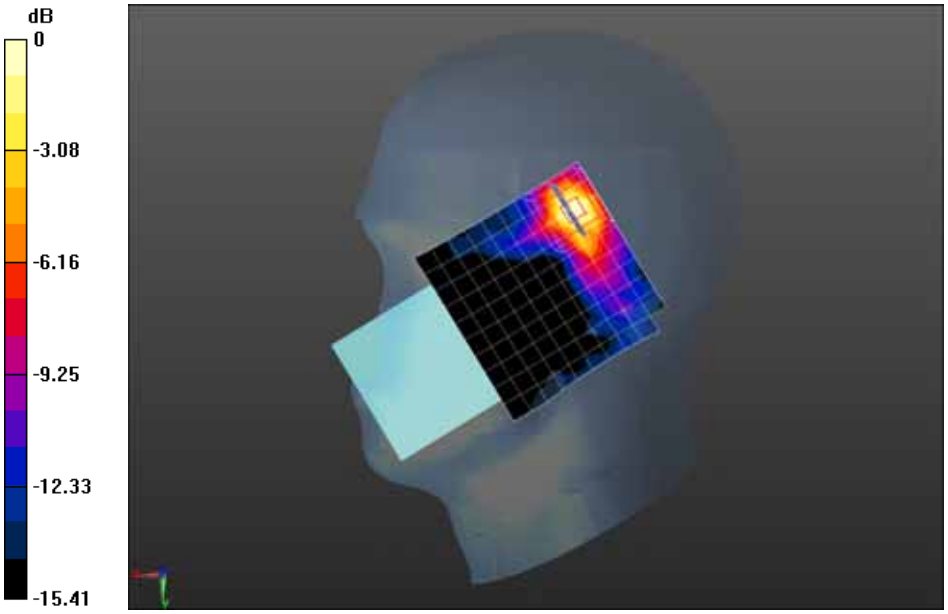
Configuration/802.11a 5180MHz Touch-Right/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 1.37 W/kg

Configuration/802.11a 5180MHz Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 5.897 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 2.21 W/kg

SAR(1 g) = 0.776 W/kg; SAR(10 g) = 0.258 W/kg Maximum value of SAR (measured) = 1.16 W/kg



0 dB = 1.16 W/kg = 0.64 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5200MHz Touch-Right

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5200 MHz; Medium parameters used: f = 5200 MHz; σ = 4.6 S/m; εr = 36.94; ρ = 1000 kg/m3 ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

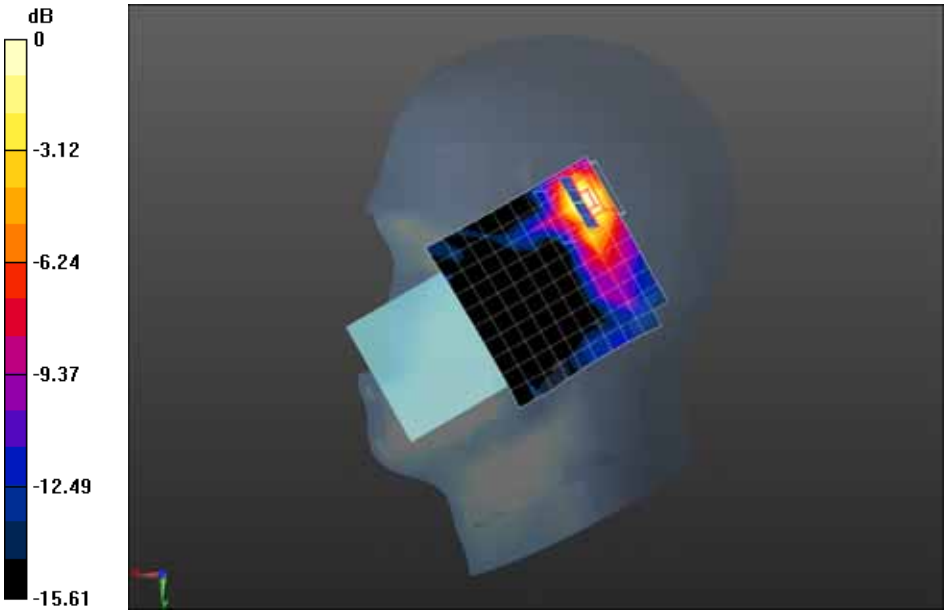
Configuration/802.11a 5200MHz Touch-Right/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 1.78 W/kg

Configuration/802.11a 5200MHz Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 5.835 V/m; Power Drift = 0.20 dB

Peak SAR (extrapolated) = 2.23 W/kg

SAR(1 g) = 0.782 W/kg; SAR(10 g) = 0.265 W/kg Maximum value of SAR (measured) = 1.17 W/kg



0 dB = 1.17 W/kg = 0.68 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5180MHz Tilt-Right

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5180 MHz; Medium parameters used: f = 5180 MHz; σ = 4.58 S/m; εr = 37.03; ρ = 1000 kg/m3 ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

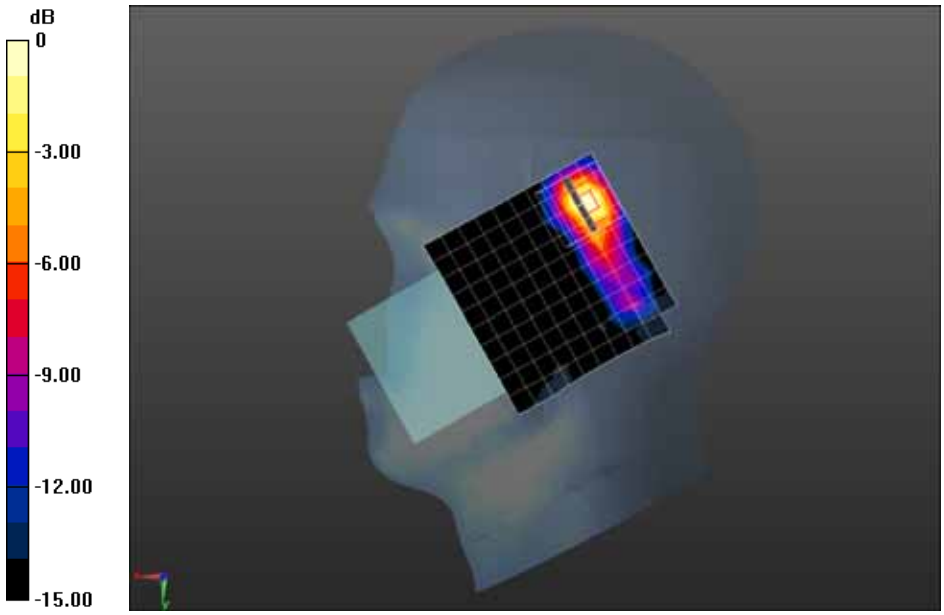
Configuration/802.11a 5180MHz Tilt-Right/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 1.47 W/kg

Configuration/802.11a 5180MHz Tilt-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 5.218 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 2.44 W/kg

SAR(1 g) = 0.828 W/kg; SAR(10 g) = 0.248 W/kg Maximum value of SAR (measured) = 1.25 W/kg



0 dB = 1.25 W/kg = 0.97 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5200MHz Tilt-Right

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5200 MHz; Medium parameters used: f = 5200 MHz; σ = 4.6 S/m; εr = 36.94; ρ = 1000 kg/m3 ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

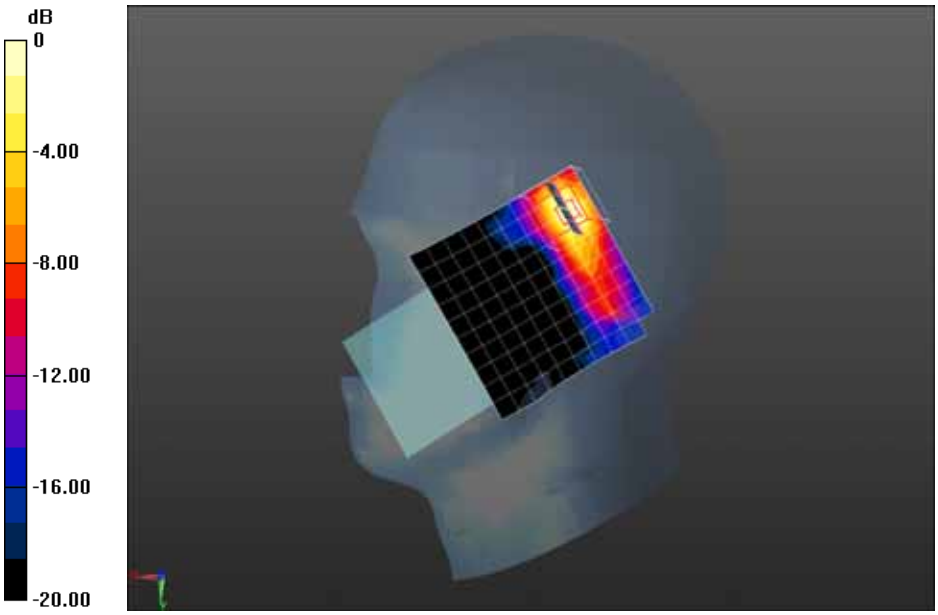
Configuration/802.11a 5200MHz Tilt-Right/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 2.04 W/kg

Configuration/802.11a 5200MHz Tilt-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 6.062 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 2.82 W/kg

SAR(1 g) = 0.953 W/kg; SAR(10 g) = 0.285 W/kg Maximum value of SAR (measured) = 1.43 W/kg



0 dB = 1.43 W/kg = 1.55 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5200MHz Tilt-Right-1

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5200 MHz; Medium parameters used: f = 5200 MHz; σ = 4.6 S/m; εr = 36.94; ρ = 1000 kg/m3 ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(5.26, 5.26, 5.26); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

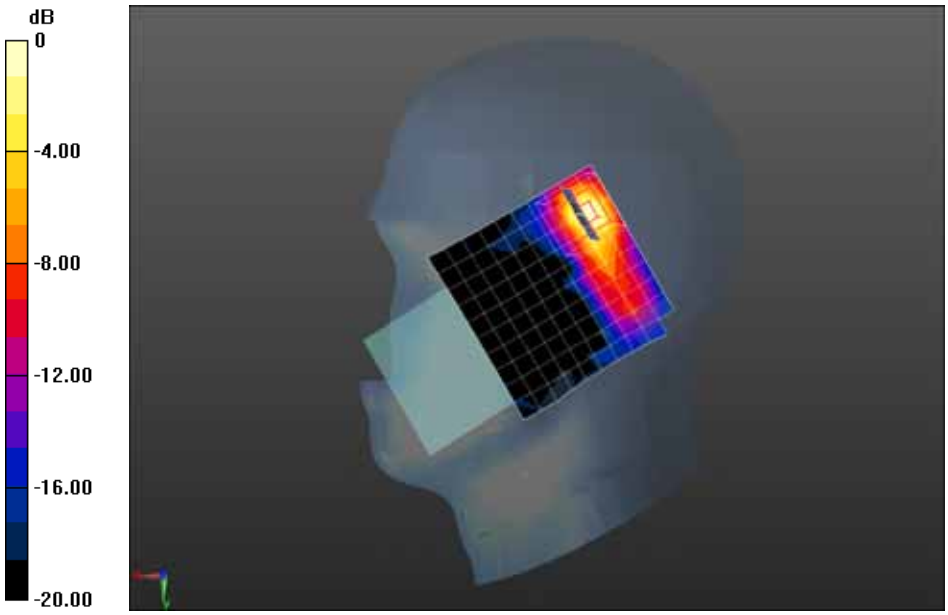
Configuration/802.11a 5200MHz Tilt-Right/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 1.67 W/kg

Configuration/802.11a 5200MHz Tilt-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 6.122 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 2.90 W/kg

SAR(1 g) = 0.975 W/kg; SAR(10 g) = 0.292 W/kg Maximum value of SAR (measured) = 1.49 W/kg



0 dB = 1.49 W/kg = 1.73 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5180MHz Body-Back

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5180 MHz; Medium parameters used: f = 5180 MHz; σ = 5.22 S/m; εr = 49.62; ρ = 1000 kg/m3 ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(4.94, 4.94, 4.94); Calibrated: 24/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

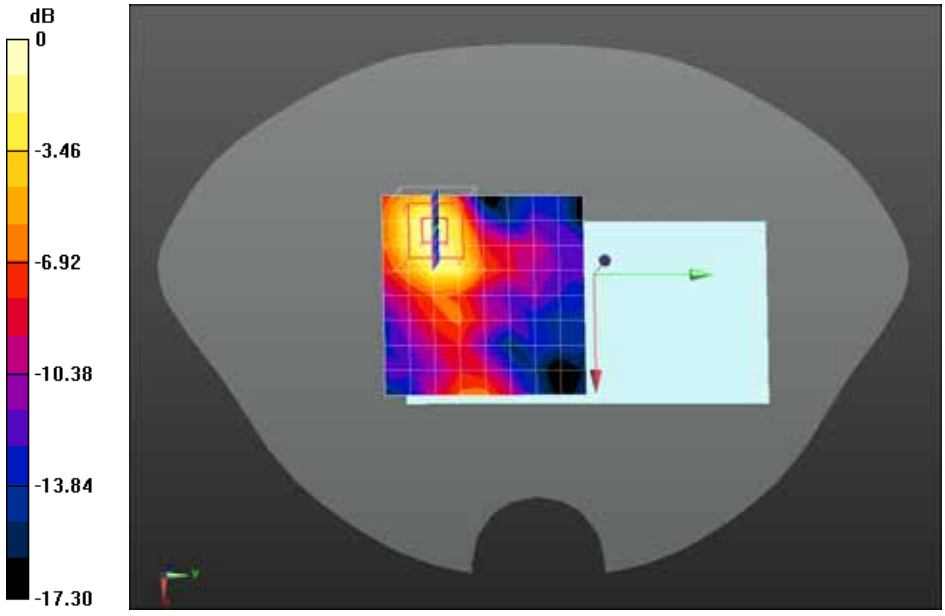
Configuration/802.11a 5180MHz Body-Back/Area Scan (9x9x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.481 W/kg

Configuration/802.11a 5180MHz Body-Back/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm; Reference Value = 2.466 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.944 W/kg

SAR(1 g) = 0.279 W/kg; SAR(10 g) = 0.114 W/kg Maximum value of SAR (measured) = 0.500 W/kg



0 dB = 0.500 W/kg = -3.01 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5180MHz Body-Front

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5180 MHz; Medium parameters used: f = 5180 MHz; σ = 5.22 S/m; εr = 49.62; ρ = 1000 kg/m3 ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(4.94, 4.94, 4.94); Calibrated: 24/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

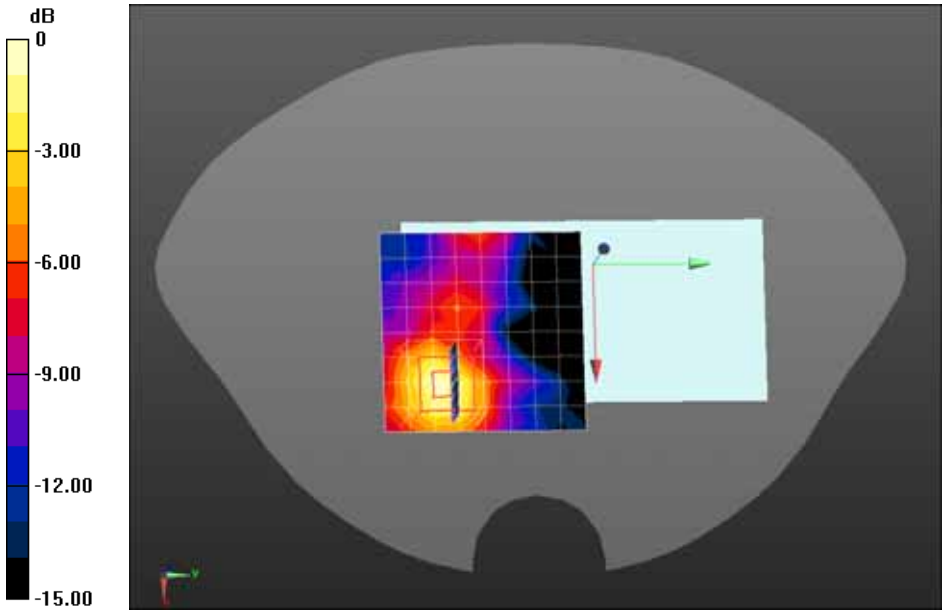
Configuration/802.11a 5180MHz Body-Front/Area Scan (9x9x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.462 W/kg

Configuration/802.11a 5180MHz Body-Front/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm; Reference Value = 1.402 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.962 W/kg

SAR(1 g) = 0.271 W/kg; SAR(10 g) = 0.110 W/kg Maximum value of SAR (measured) = 0.484 W/kg



0 dB = 0.484 W/kg = -3.15 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5180MHz Body-Left side

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5180 MHz; Medium parameters used: f = 5180 MHz; σ = 5.22 S/m; εr = 49.62; ρ = 1000 kg/m3 ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(4.94, 4.94, 4.94); Calibrated: 24/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

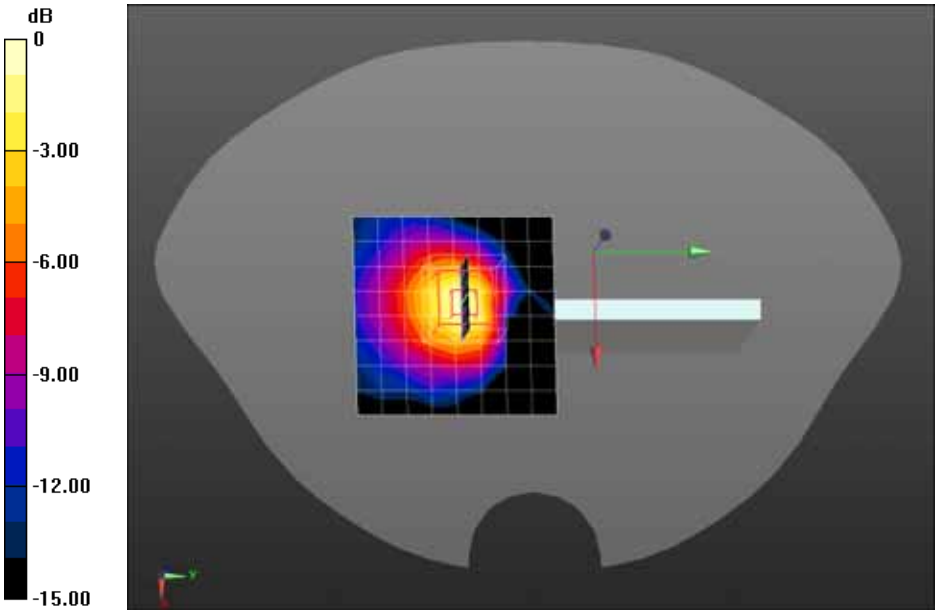
Configuration/802.11a 5180MHz Body-Left side/Area Scan (9x9x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.719 W/kg

Configuration/802.11a 5180MHz Body-Left side/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm; Reference Value = 1.801 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.71 W/kg

SAR(1 g) = 0.460 W/kg; SAR(10 g) = 0.165 W/kg Maximum value of SAR (measured) = 0.869 W/kg



0 dB = 0.869 W/kg = -0.61 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5180MHz Body-Top

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5180 MHz; Medium parameters used: f = 5180 MHz; σ = 5.22 S/m; εr = 49.62; ρ = 1000 kg/m3 ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

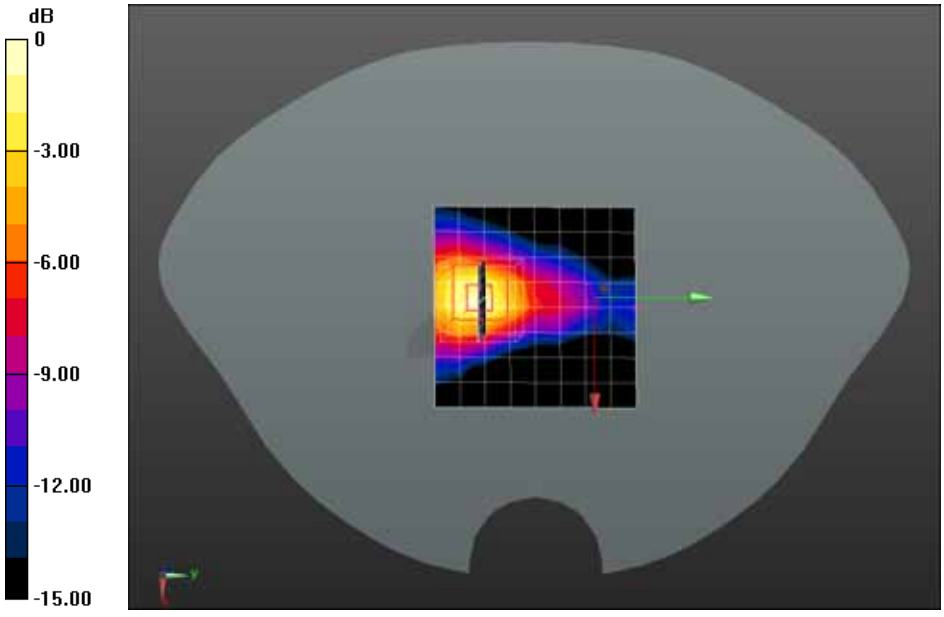
- Probe: EX3DV4 - SN3753; ConvF(4.94, 4.94, 4.94); Calibrated: 24/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/802.11a 5180MHz Body-Top/Area Scan (9x9x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (measured) = 1.06 W/kg

Configuration/802.11a 5180MHz Body-Top/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm; Reference Value = 4.974 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 2.27 W/kg

SAR(1 g) = 0.588 W/kg; SAR(10 g) = 0.203 W/kg Maximum value of SAR (measured) = 1.11 W/kg



0 dB = 1.11 W/kg = 0.45 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5785MHz Touch-Left

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5785 MHz; Medium parameters used: f = 5785 MHz; σ = 5.14 S/m; εr = 34.28; ρ = 1000 kg/m3 ; Phantom section: Left Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(4.72, 4.72, 4.72); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

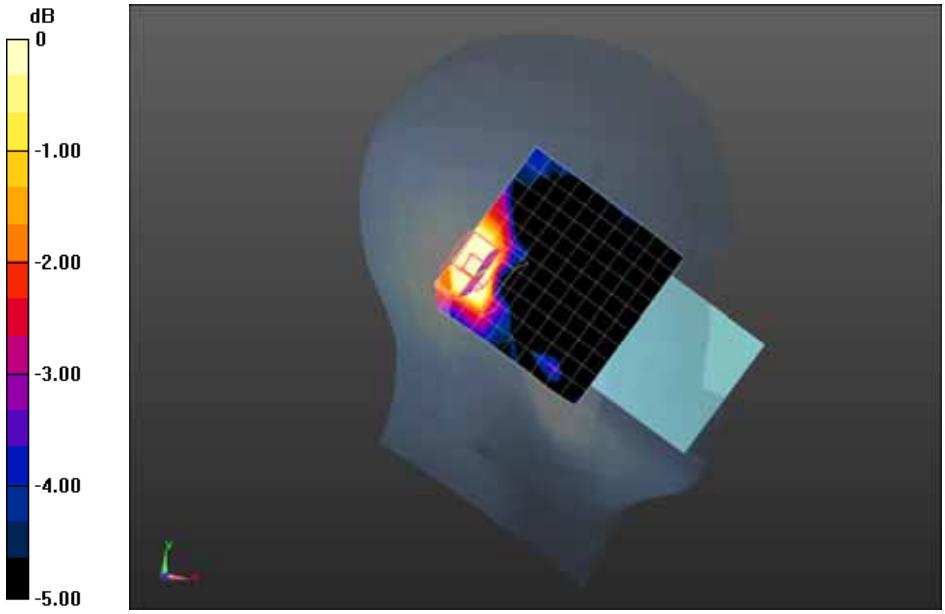
Configuration/802.11a 5785MHz Touch-Left/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.241 W/kg

Configuration/802.11a 5785MHz Touch-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 3.039 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 0.256 W/kg

SAR(1 g) = 0.131 W/kg; SAR(10 g) = 0.092 W/kg Maximum value of SAR (measured) = 0.142 W/kg



0 dB = 0.142 W/kg = -8.48 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5785MHz Tilt-Left

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5785 MHz; Medium parameters used: f = 5785 MHz; σ = 5.14 S/m; εr = 34.28; ρ = 1000 kg/m3 ; Phantom section: Left Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

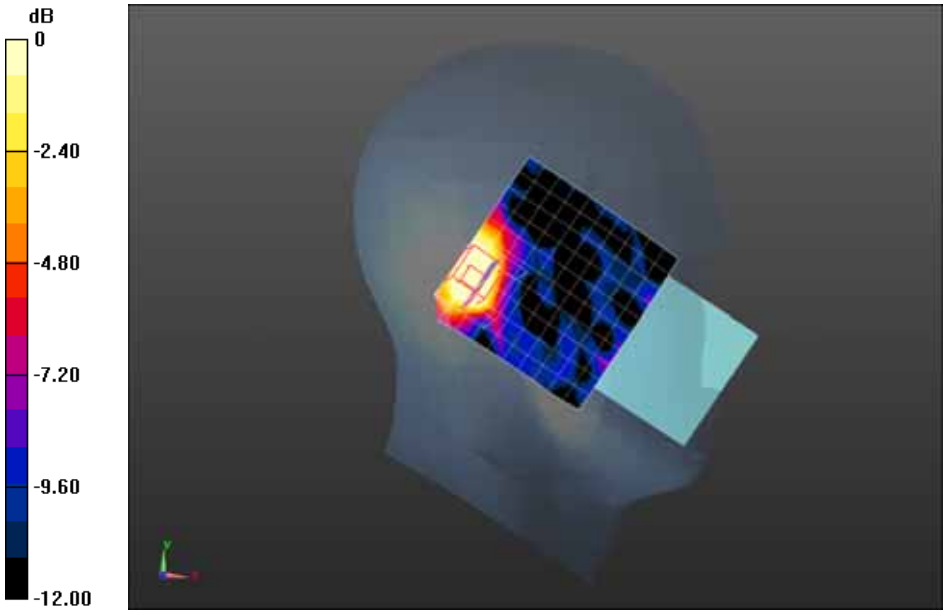
- Probe: EX3DV4 - SN3753; ConvF(4.72, 4.72, 4.72); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Configuration/802.11a 5785MHz Tilt-Left/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (measured) = 0.248 W/kg

Configuration/802.11a 5785MHz Tilt-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 2.227 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.343 W/kg

SAR(1 g) = 0.115 W/kg; SAR(10 g) = 0.051 W/kg Maximum value of SAR (measured) = 0.127 W/kg



0 dB = 0.127 W/kg = -8.96 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5785MHz Touch-Right

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5785 MHz; Medium parameters used: f = 5785 MHz; σ = 5.14 S/m; εr = 34.28; ρ = 1000 kg/m3 ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(4.72, 4.72, 4.72); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

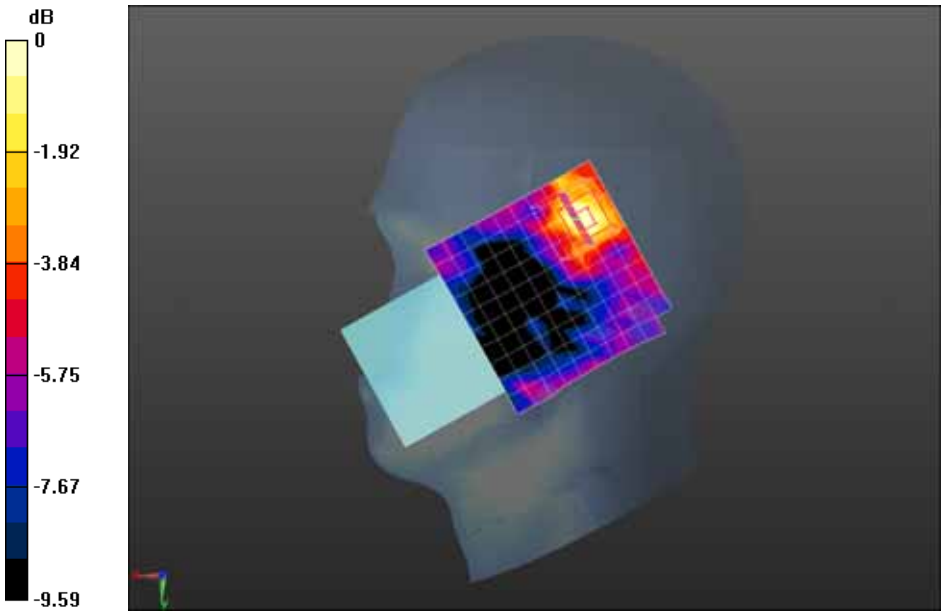
Configuration/802.11a 5785MHz Touch-Right/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.342 W/kg

Configuration/802.11a 5785MHz Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 3.584 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.387 W/kg

SAR(1 g) = 0.183 W/kg; SAR(10 g) = 0.110 W/kg Maximum value of SAR (measured) = 0.245 W/kg



0 dB = 0.245 W/kg = -6.11 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5785MHz Tilt-Right

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5785 MHz; Medium parameters used: f = 5785 MHz; σ = 5.14 S/m; εr = 34.28; ρ = 1000 kg/m3 ; Phantom section: Right Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(4.72, 4.72, 4.72); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

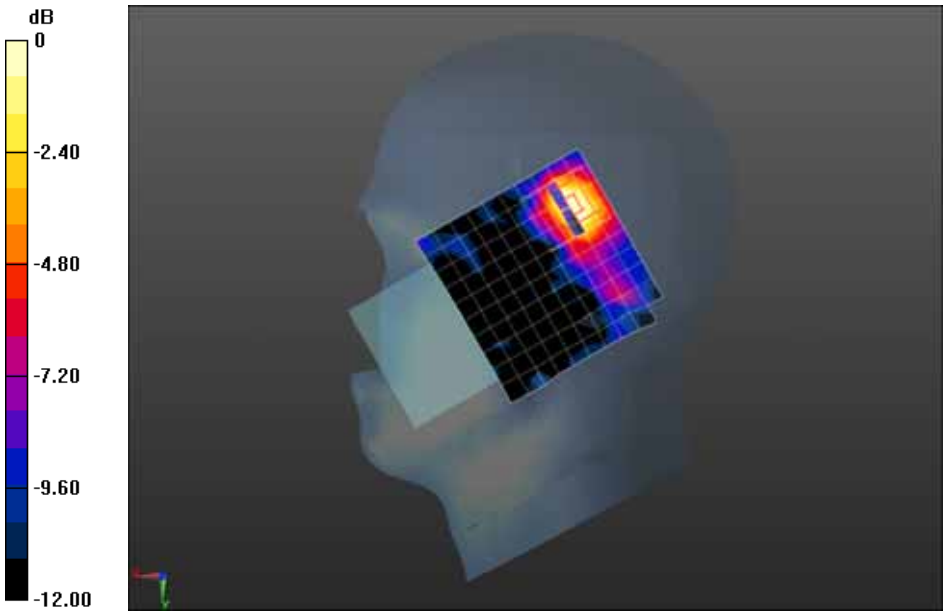
Configuration/802.11a 5785MHz Tilt-Right/Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm

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

Configuration/802.11a 5785MHz Tilt-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm; Reference Value = 2.847 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.489 W/kg

SAR(1 g) = 0.163 W/kg; SAR(10 g) = 0.064 W/kg Maximum value of SAR (measured) = 0.230 W/kg



0 dB = 0.230 W/kg = -6.38 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5785MHz Body-Back

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5785 MHz; Medium parameters used: f = 5785 MHz; σ = 6.09 S/m; εr = 47.94; ρ = 1000 kg/m3 ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(4.36, 4.36, 4.36); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

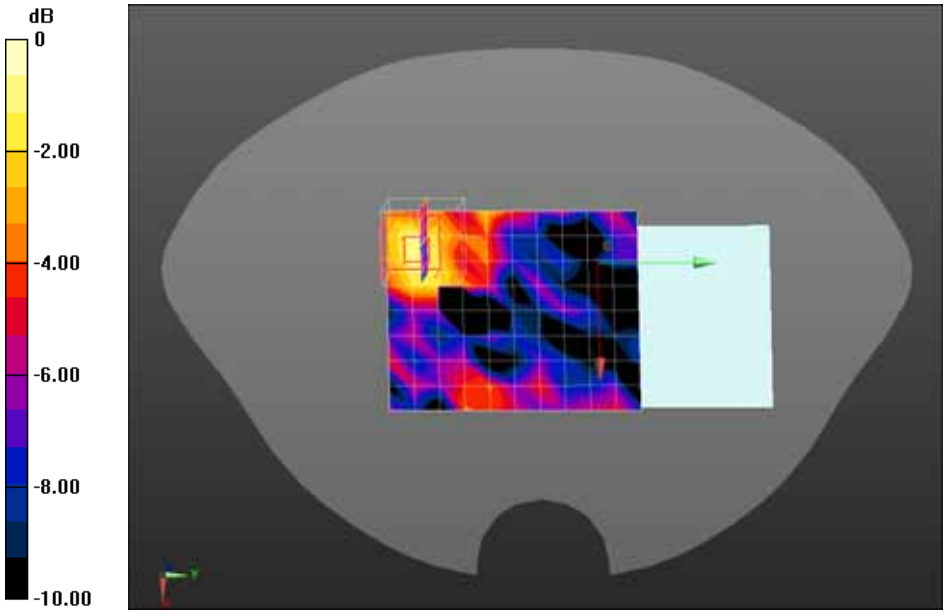
Configuration/802.11a 5785MHz Body-Back/Area Scan (9x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.0757 W/kg

Configuration/802.11a 5785MHz Body-Back/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm; Reference Value = 1.992 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.195 W/kg

SAR(1 g) = 0.054 W/kg; SAR(10 g) = 0.032 W/kg Maximum value of SAR (measured) = 0.0931 W/kg



0 dB = 0.0931 W/kg = -10.31 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5785MHz Body-Front

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5785 MHz; Medium parameters used: f = 5785 MHz; σ = 6.09 S/m; εr = 47.94; ρ = 1000 kg/m3 ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(4.36, 4.36, 4.36); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

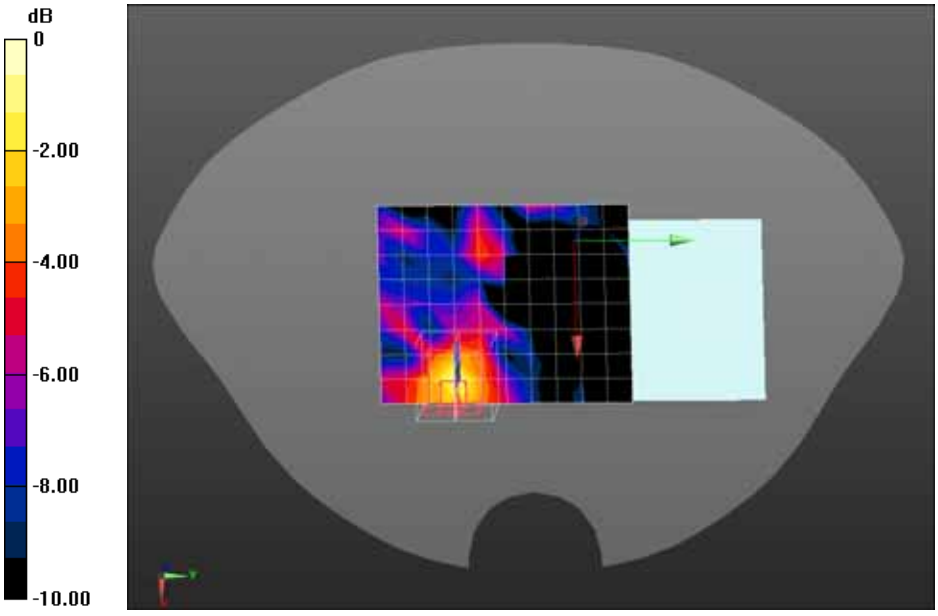
Configuration/802.11a 5785MHz Body-Front/Area Scan (9x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.0886 W/kg

Configuration/802.11a 5785MHz Body-Front/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm; Reference Value = 1.488 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.182 W/kg

SAR(1 g) = 0.055 W/kg; SAR(10 g) = 0.032 W/kg Maximum value of SAR (measured) = 0.0982 W/kg



0 dB = 0.0982 W/kg = -10.08 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5785MHz Body-Left side

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5785 MHz; Medium parameters used: f = 5785 MHz; σ = 6.09 S/m; εr = 47.94; ρ = 1000 kg/m3 ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(4.36, 4.36, 4.36); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

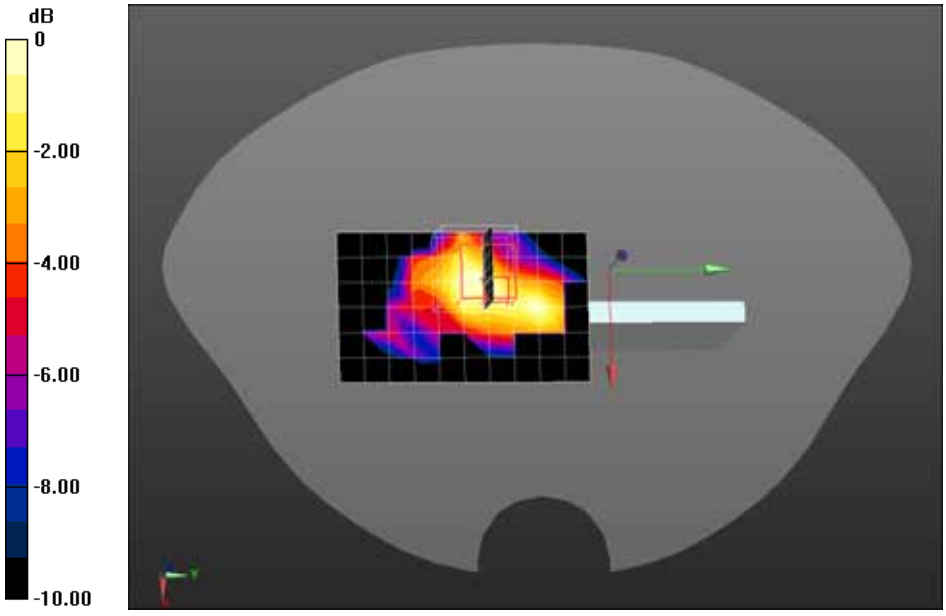
Configuration/802.11a 5785MHz Body-Left side/Area Scan (7x11x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.0376 W/kg

Configuration/802.11a 5785MHz Body-Left side/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm; Reference Value = 1.290 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.187 W/kg

SAR(1 g) = 0.017 W/kg; SAR(10 g) = 0.00487 W/kg Maximum value of SAR (measured) = 0.0378 W/kg



0 dB = 0.0378 W/kg = -14.23 dBW/kg

Date/Time: 03-07-2016

Test Laboratory: QuieTek Lab

802.11a 5785MHz Body-Top

DUT: Smart Phone; Type: FTU152B Smart HD

Communication System: UID 0, CW (0); Communication System Band: 5GHz(5000.0-6000.0MHz); Duty Cycle: 1:1.0; Frequency: 5785 MHz; Medium parameters used: f = 5785 MHz; σ = 6.09 S/m; εr = 47.94; ρ = 1000 kg/m3 ; Phantom section: Flat Section

Ambient temperature (℃): 21.5, Liquid temperature (℃): 21.0

DASY5 Configuration:

- Probe: EX3DV4 - SN3753; ConvF(4.36, 4.36, 4.36); Calibrated: 10/04/2015;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 16/06/2015
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

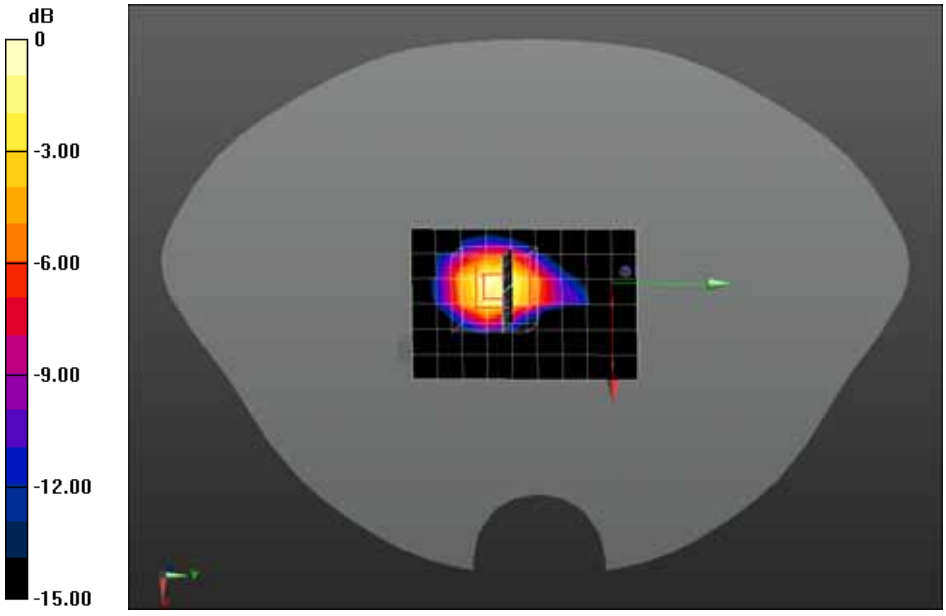
Configuration/802.11a 5785MHz Body-Top/Area Scan (7x10x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.183 W/kg

Configuration/802.11a 5785MHz Body-Top/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=2mm; Reference Value = 1.756 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.438 W/kg

SAR(1 g) = 0.098 W/kg; SAR(10 g) = 0.032 W/kg Maximum value of SAR (measured) = 0.212 W/kg

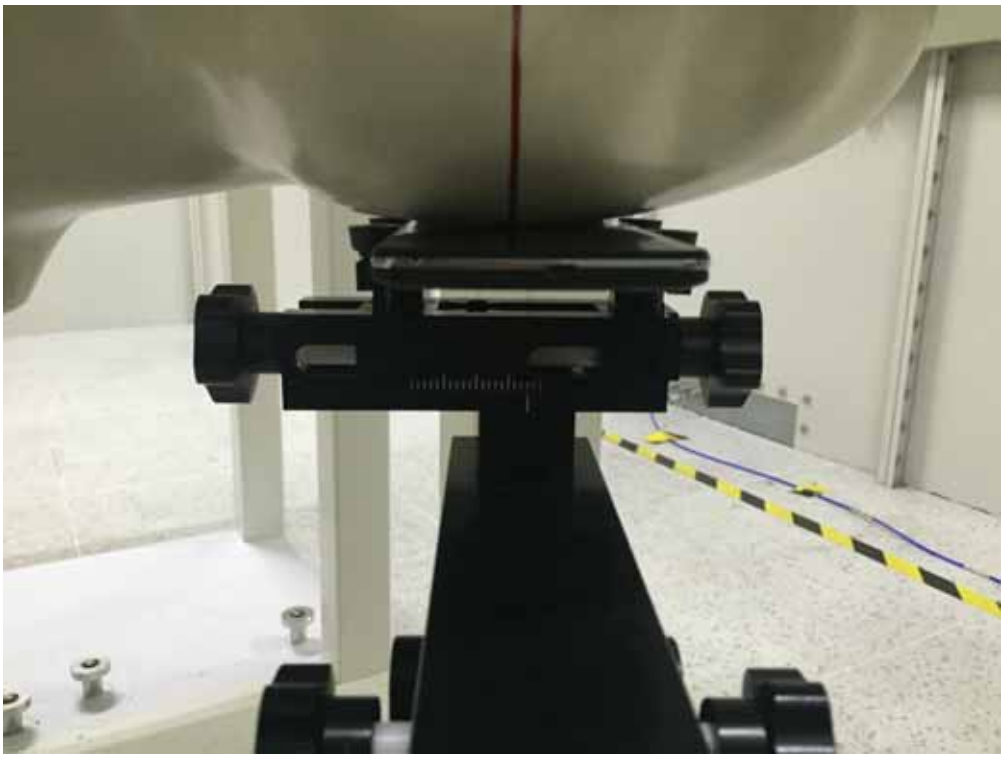


0 dB = 0.212 W/kg = -6.74 dBW/kg

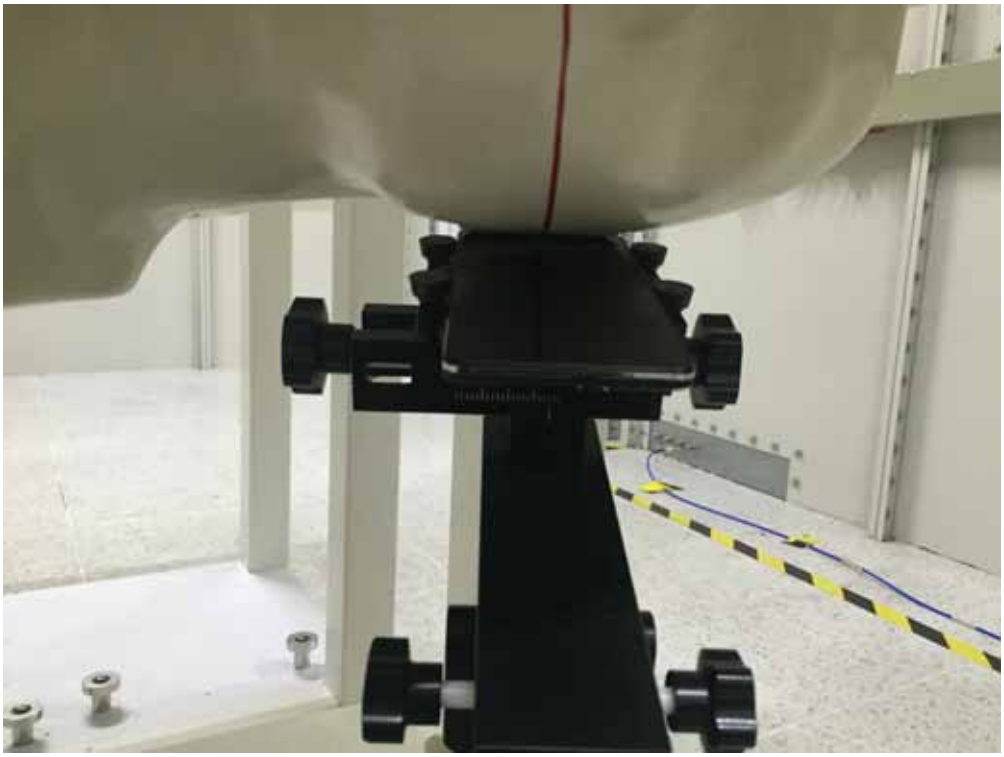
Appendix C. Test Setup Photographs & EUT Photographs

Test Setup Photographs

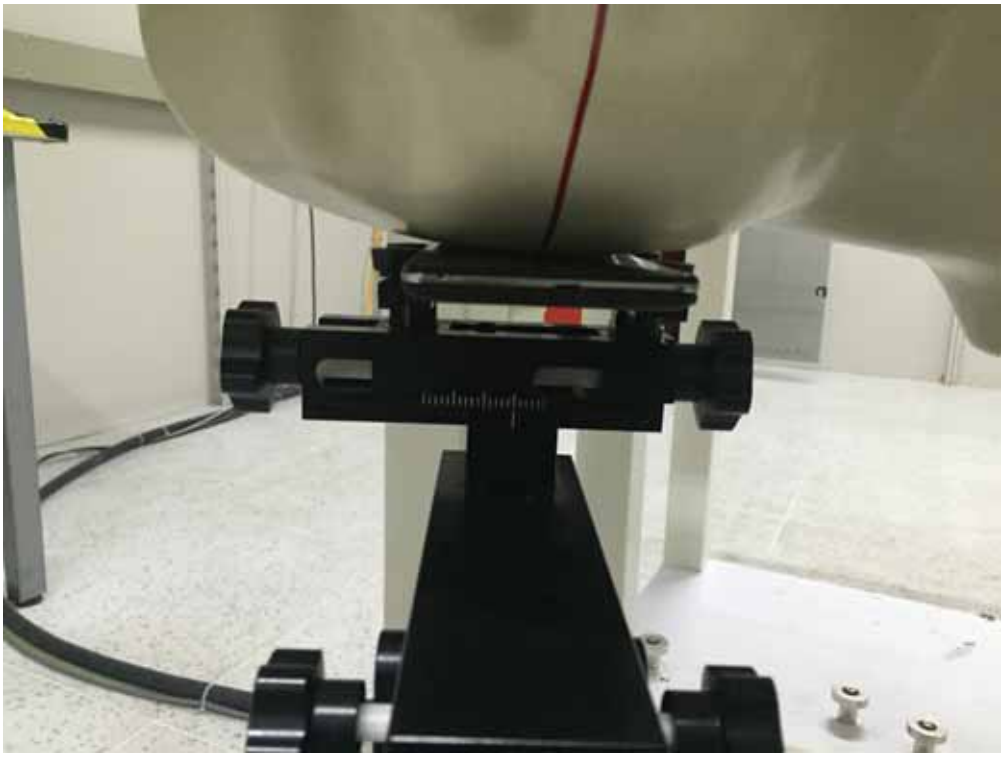
Left Head (EUT Cheek)



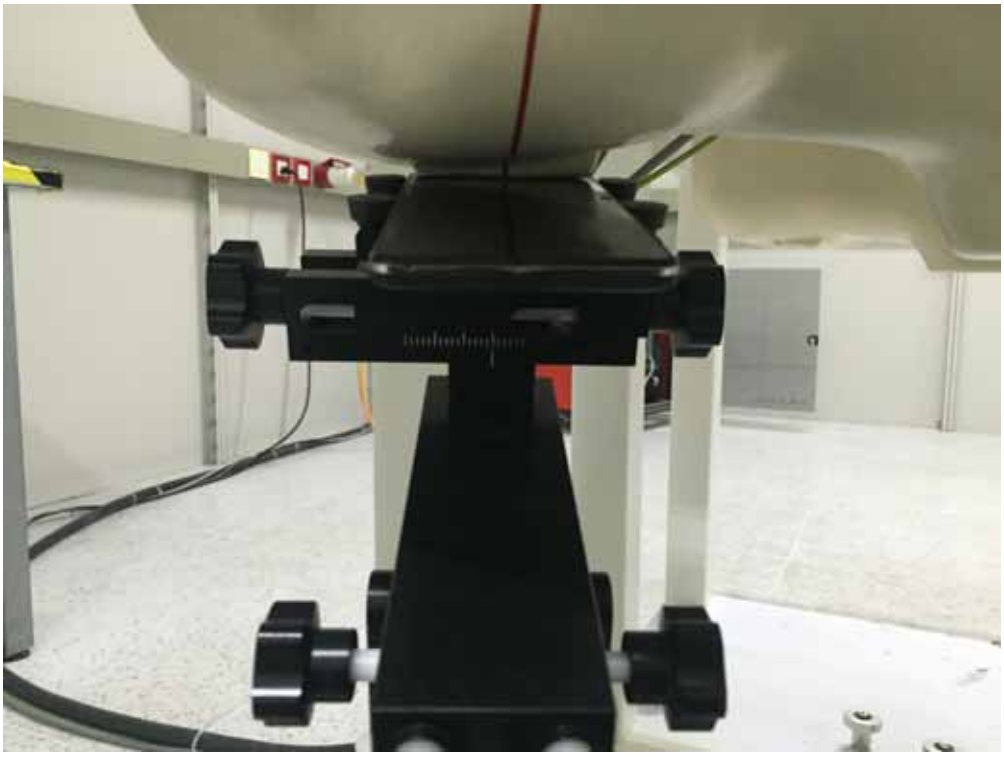
Left Head (EUT Tilted)



Right Head (EUT Cheek)



Right Head (EUT Tilted)



Body Back at 10mm WLAN

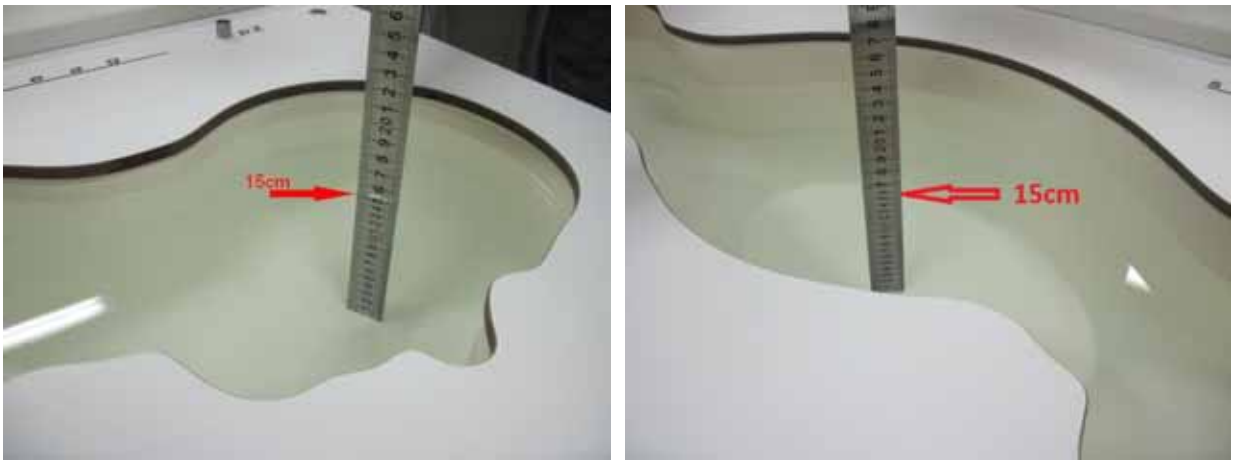
Body Front at 10mm WLAN

Body Left side at 10mm WLAN

Body Top at 10mm WLAN

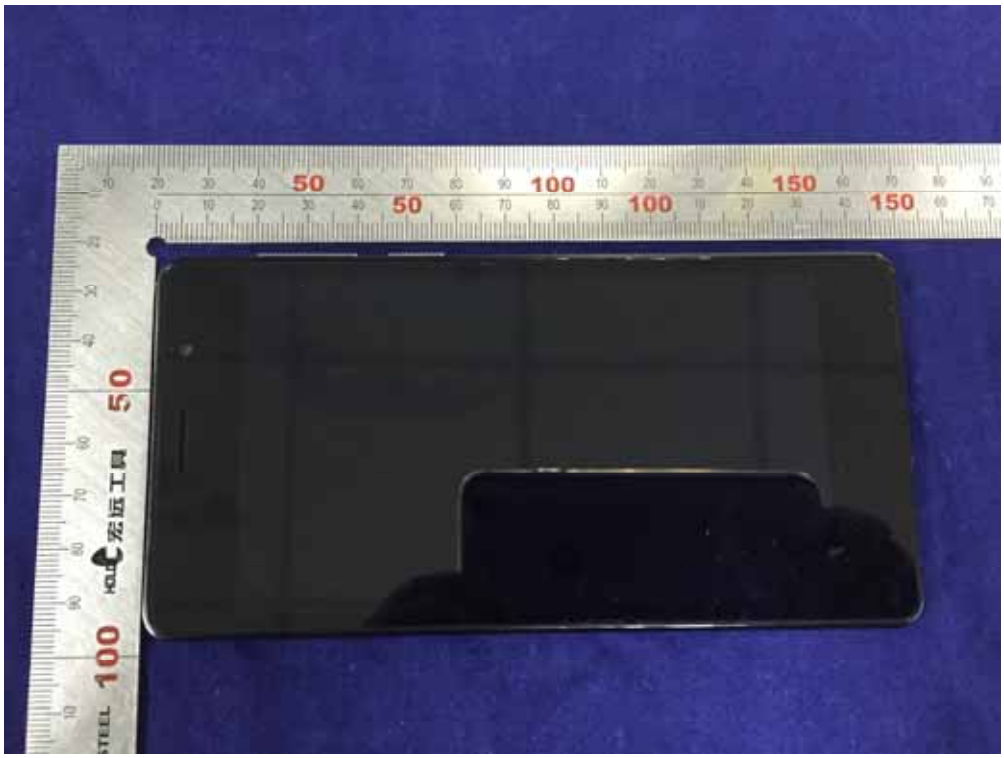
Depth of the liquid in the phantom – Zoom in

Note: The position used in the measurements were according to IEEE 1528 - 2013



EUT Photographs

(1) EUT Photo



(2) EUT Photo

(3) EUT Photo

(4) EUT Photo

Appendix D. Probe Calibration Data

In Collaboration with
CTTL speag
CALIBRATION LABORATORY
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China
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E-mail: cttl@chinattl.com Http://www.chinattl.cn

ilac-MRA CNAS CALIBRATION No. L0570

Client Auden Certificate No: Z15-97051

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3753
Calibration Procedure(s)	FD-Z11-2-004-01 Calibration Procedures for Dosimetric E-field Probes
Calibration date:	April 24, 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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101547	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Power sensor NRP-Z91	101548	01-Jul-14 (CTTL, No.J14X02146)	Jun-15
Reference10dBAttenuator	18N50W-10dB	13-Mar-14(TMC,No.JZ14-1103)	Mar-16
Reference20dBAttenuator	18N50W-20dB	13-Mar-14(TMC,No.JZ14-1104)	Mar-16
Reference Probe EX3DV4	SN 3617	28-Aug-14(SPEAG,No.EX3-3617_Aug14)	Aug-15
DAE4	SN 777	17-Sep-14 (SPEAG, DAE4-777_Sep14)	Sep -15
Secondary Standards	**ID #**	**Cal Date(Calibrated by, Certificate No.)**	**Scheduled Calibration**
SignalGeneratorMG3700A	6201052605	01-Jul-14 (CTTL, No.J14X02145)	Jun-15
Network Analyzer E5071C	MY46110673	03-Feb-15 (CTTL, No.J15X00728)	Feb-16

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

Issued: April 26, 2015

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

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

Methods Applied and Interpretation of Parameters:

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

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

Probe EX3DV4

SN: 3753

Calibrated: April 24, 2015

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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s p e a g
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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3753

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(μV/(V/m)^2)^A	0.47	0.29	0.46	±10.8%
DCP(mV)^B	104.1	107.0	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	196.8	±2.2%
		Y	0.0	0.0	1.0		148.4	
		Z	0.0	0.0	1.0		192.8	

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

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

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3753

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	41.9	0.89	9.53	9.53	9.53	0.35	1.10	±12%
835	41.5	0.90	9.04	9.04	9.04	0.13	1.43	±12%
900	41.5	0.97	8.95	8.95	8.95	0.19	1.14	±12%
1450	40.5	1.20	8.61	8.61	8.61	0.13	1.41	±12%
1750	40.1	1.37	8.07	8.07	8.07	0.19	1.21	±12%
1900	40.0	1.40	7.71	7.71	7.71	0.23	1.11	±12%
2000	40.0	1.40	7.66	7.66	7.66	0.24	1.08	±12%
2450	39.2	1.80	7.15	7.15	7.15	0.29	1.23	±12%
2600	39.0	1.96	7.03	7.03	7.03	0.31	1.23	±12%
5200	36.0	4.66	5.26	5.26	5.26	0.47	1.35	±13%
5300	35.9	4.76	5.16	5.16	5.16	0.46	1.30	±13%
5500	35.6	4.96	5.00	5.00	5.00	0.45	1.42	±13%
5600	35.5	5.07	4.86	4.86	4.86	0.46	1.43	±13%
5800	35.3	5.27	4.72	4.72	4.72	0.46	1.41	±13%

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

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3753

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz][C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha[G]	Depth[G] (mm)	Unct. (k=2)
750	55.5	0.96	9.41	9.41	9.41	0.18	1.26	±12%
835	55.2	0.97	9.31	9.31	9.31	0.20	1.30	±12%
900	55.0	1.05	9.03	9.03	9.03	0.28	1.08	±12%
1450	54.0	1.30	8.10	8.10	8.10	0.28	1.00	±12%
1750	53.4	1.49	7.70	7.70	7.70	0.17	1.28	±12%
1900	53.3	1.52	7.48	7.48	7.48	0.12	1.94	±12%
2000	53.3	1.52	7.64	7.64	7.64	0.15	1.86	±12%
2450	52.7	1.95	7.22	7.22	7.22	0.41	1.01	±12%
2600	52.5	2.16	7.16	7.16	7.16	0.48	0.89	±12%
5200	49.0	5.30	4.94	4.94	4.94	0.49	1.07	±13%
5300	48.9	5.42	4.72	4.72	4.72	0.49	1.02	±13%
5500	48.6	5.65	4.27	4.27	4.27	0.53	1.13	±13%
5600	48.5	5.77	4.22	4.22	4.22	0.52	1.19	±13%
5800	48.2	6.00	4.36	4.36	4.36	0.51	1.27	±13%

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

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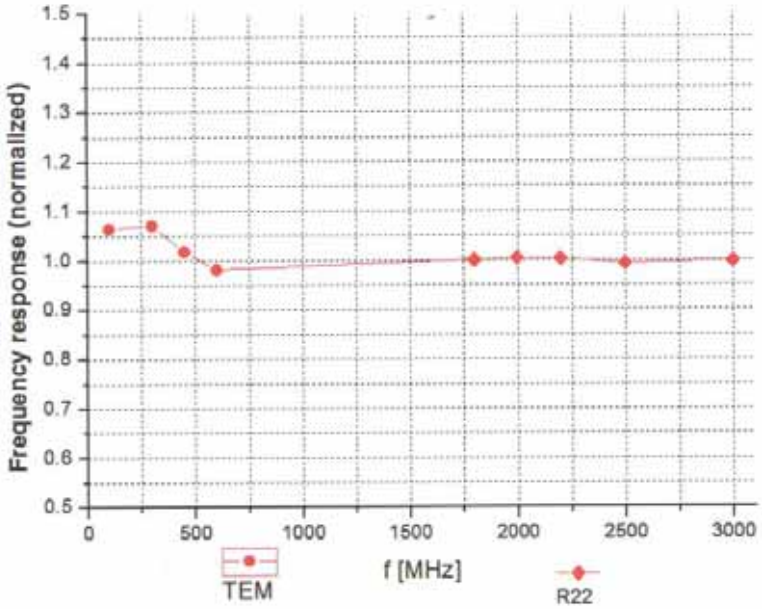
Frequency Response of E-Field
(TEM-Cell: ifi110 EXX, Waveguide: R22)



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

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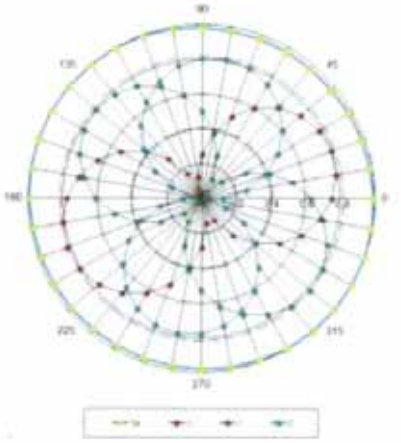
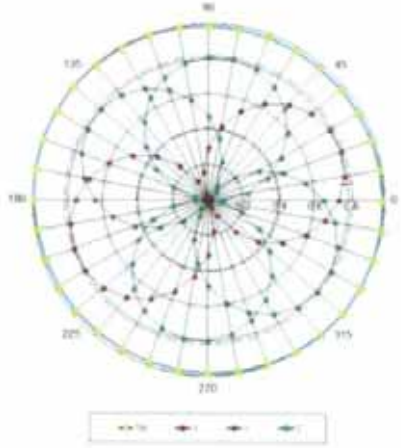
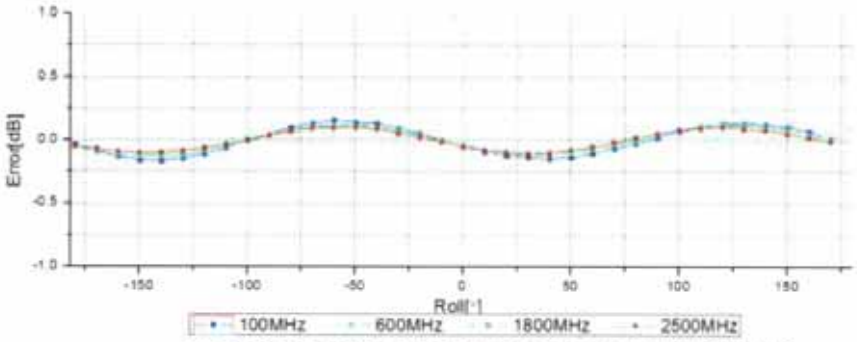
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM



f=1800 MHz, R22





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

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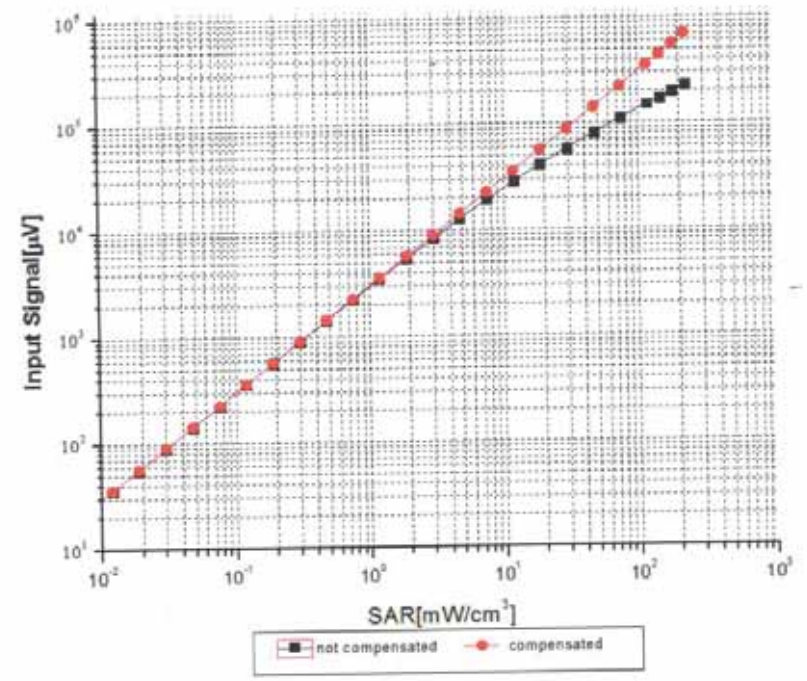
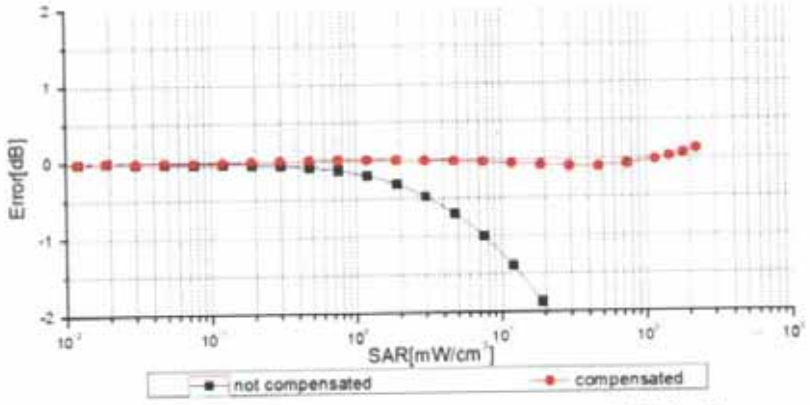
Dynamic Range f(SAR_{head})
(TEM cell, f = 900 MHz)





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

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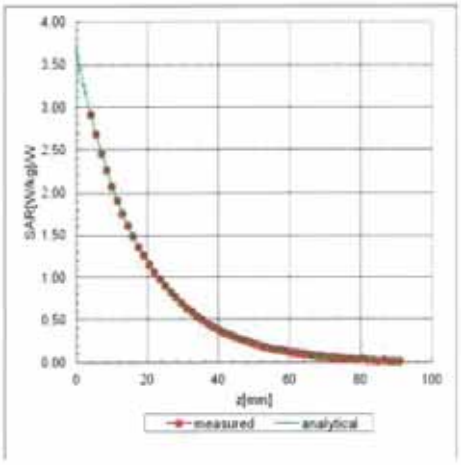
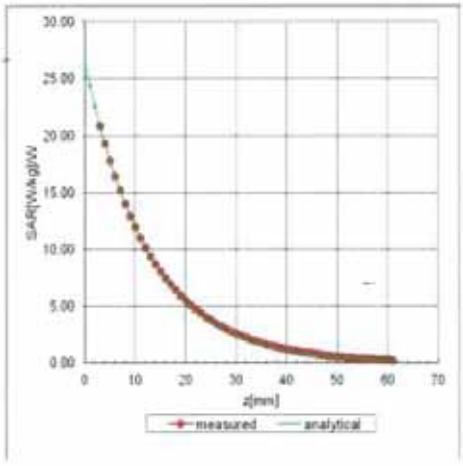
Conversion Factor Assessment

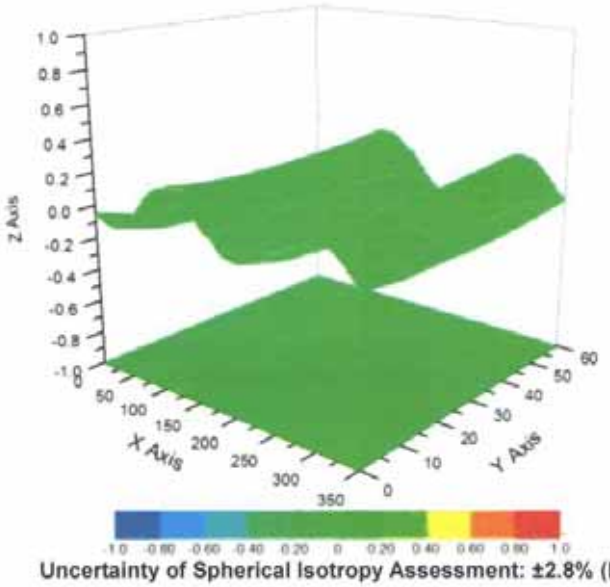
f=900 MHz, WGLS R9(H_convF)



f=1750 MHz, WGLS R22(H_convF)



Deviation from Isotropy in Liquid



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

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DASY/EASY – Parameters of Probe: EX3DV4 – SN: 3753

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	36.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

Appendix E. Dipole Calibration Data

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

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 Auden

Certificate No: D5GHzV2-1203_Dec15

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1203
Calibration procedure(s)	QA CAL-22.v2 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	December 15, 2015

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	US37292783	07-Oct-15 (No. 217-02222)	Oct-16
Power sensor HP 8481A	MY41092317	07-Oct-15 (No. 217-02223)	Oct-16
Reference 20 dB Attenuator	SN: 5058 (20k)	01-Apr-15 (No. 217-02131)	Mar-16
Type-N mismatch combination	SN: 5047.2 / 06327	01-Apr-15 (No. 217-02134)	Mar-16
Reference Probe EX3DV4	SN: 3503	30-Dec-14 (No. EX3-3503_Dec14)	Dec-15
DAE4	SN: 601	17-Aug-15 (No. DAE4-601_Aug15)	Aug-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100972	15-Jun-15 (in house check Jun-15)	In house check: Jun-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 16, 2015

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-2, "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
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
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	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.3 ± 6 %	4.57 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.2 ± 6 %	4.66 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.3 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.5 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	4.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.21 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.4 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	34.8 ± 6 %	4.97 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	8.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.7 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	34.5 ± 6 %	5.18 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	8.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.8 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3 ± 6 %	5.34 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.61 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	2.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.1 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.1 ± 6 %	5.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.7 ± 6 %	5.73 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.02 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.2 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	46.6 ± 6 %	5.87 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	8.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**80.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.6 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	46.2 ± 6 %	6.15 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	7.78 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	48.6 Ω - 6.0 jΩ
Return Loss	- 24.1 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	49.3 Ω - 2.1 jΩ
Return Loss	- 33.0 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	48.2 Ω + 1.3 jΩ
Return Loss	- 32.9 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	53.4 Ω + 1.2 jΩ
Return Loss	- 29.1 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	52.5 Ω + 5.1 jΩ
Return Loss	- 25.1 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	47.3 Ω - 4.6 jΩ
Return Loss	- 25.2 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	48.2 Ω - 1.3 jΩ
Return Loss	- 32.8 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	47.9 Ω + 1.9 jΩ
Return Loss	- 30.6 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	52.1 Ω + 2.6 jΩ
Return Loss	- 29.6 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	52.1 Ω + 2.6 jΩ
Return Loss	- 29.6 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	53.0 Ω + 6.0 jΩ
Return Loss	- 23.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.192 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	September 11, 2014

DASY5 Validation Report for Head TSL

Date: 14.12.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1203

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.57 S/m; ε_r = 35.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.66 S/m; ε_r = 35.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.86 S/m; ε_r = 34.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.97 S/m; ε_r = 34.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.18 S/m; ε_r = 34.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2014, ConvF(5.21, 5.21, 5.21); Calibrated: 30.12.2014, ConvF(5.12, 5.12, 5.12); Calibrated: 30.12.2014, ConvF(4.92, 4.92, 4.92); Calibrated: 30.12.2014, ConvF(4.9, 4.9, 4.9); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

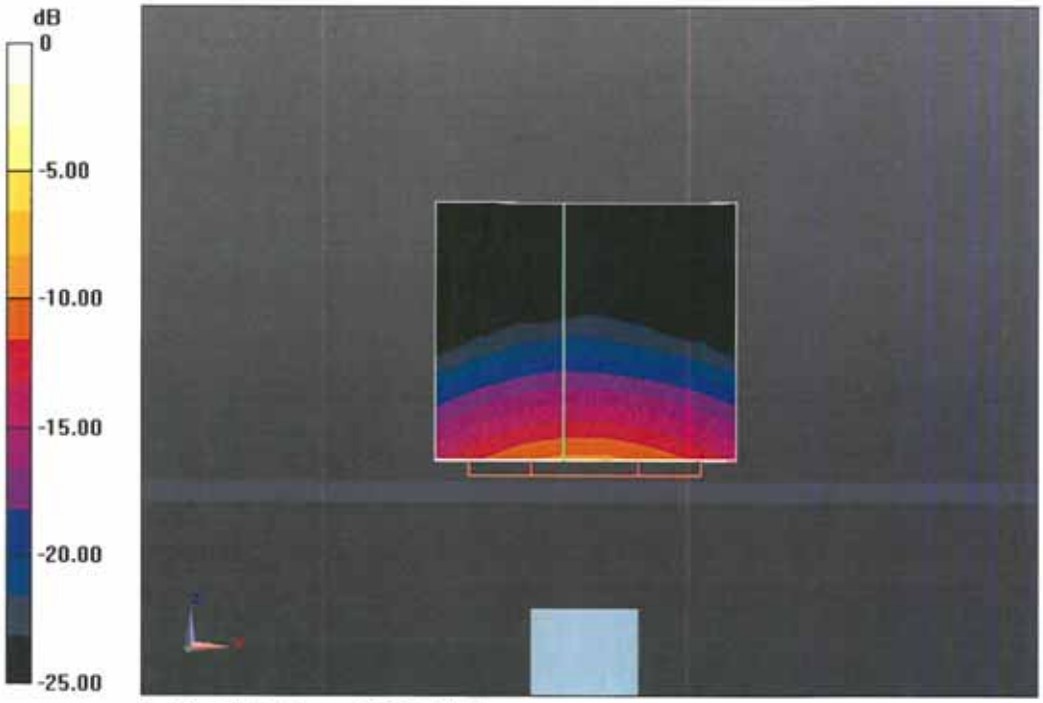
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 74.35 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 29.2 W/kg
SAR(1 g) = 7.97 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 18.0 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 74.25 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 31.0 W/kg
SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.36 W/kg
Maximum value of SAR (measured) = 18.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 73.35 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 32.3 W/kg
SAR(1 g) = 8.21 W/kg; SAR(10 g) = 2.35 W/kg
Maximum value of SAR (measured) = 19.1 W/kg

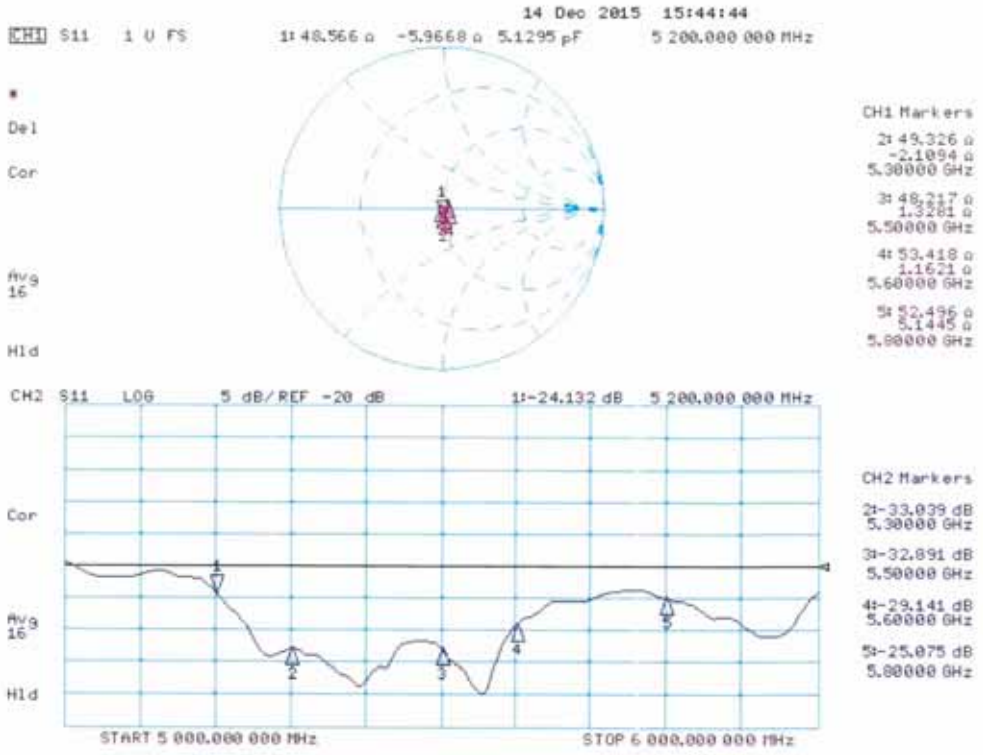
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 74.00 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 33.2 W/kg
SAR(1 g) = 8.33 W/kg; SAR(10 g) = 2.38 W/kg
Maximum value of SAR (measured) = 19.5 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 = 71.62 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 33.5 W/kg
SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 18.0 W/kg = 12.55 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 15.12.2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1203

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.34 S/m; ε_r = 47.3; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.47 S/m; ε_r = 47.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.73 S/m; ε_r = 46.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.87 S/m; ε_r = 46.6; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.15 S/m; ε_r = 46.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.95, 4.95, 4.95); Calibrated: 30.12.2014, ConvF(4.78, 4.78, 4.78); Calibrated: 30.12.2014, ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2014, ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2014, ConvF(4.32, 4.32, 4.32); Calibrated: 30.12.2014;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 17.08.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

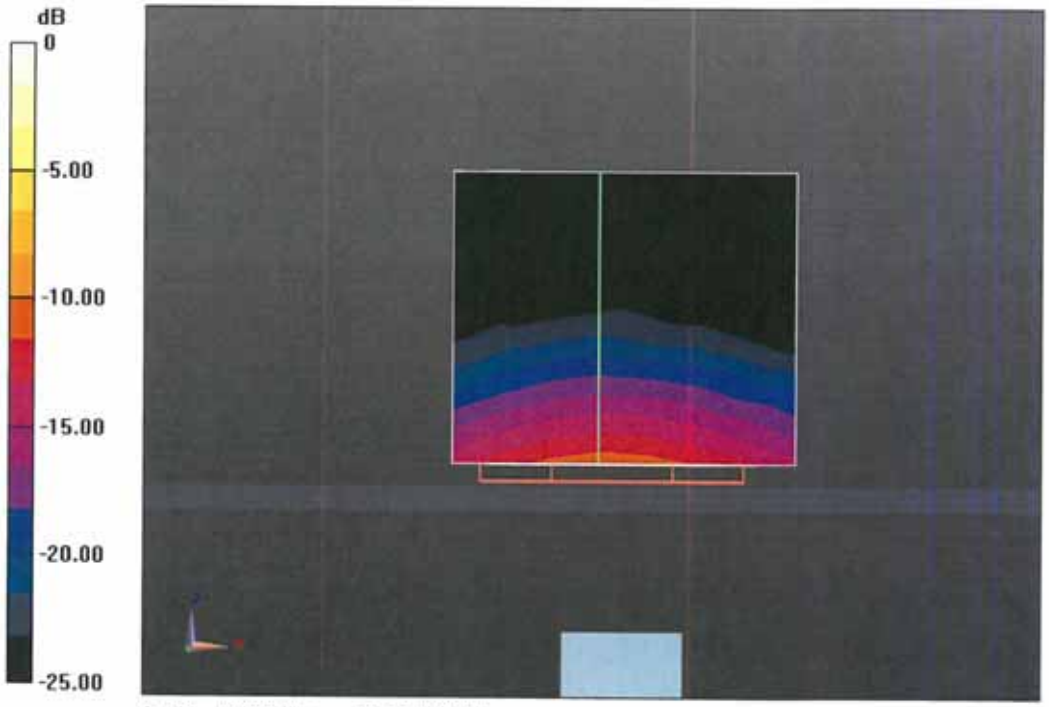
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.44 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 29.6 W/kg
SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.13 W/kg
Maximum value of SAR (measured) = 18.0 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.03 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 30.5 W/kg
SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.15 W/kg
Maximum value of SAR (measured) = 18.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.92 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 34.2 W/kg
SAR(1 g) = 8.02 W/kg; SAR(10 g) = 2.24 W/kg
Maximum value of SAR (measured) = 19.7 W/kg

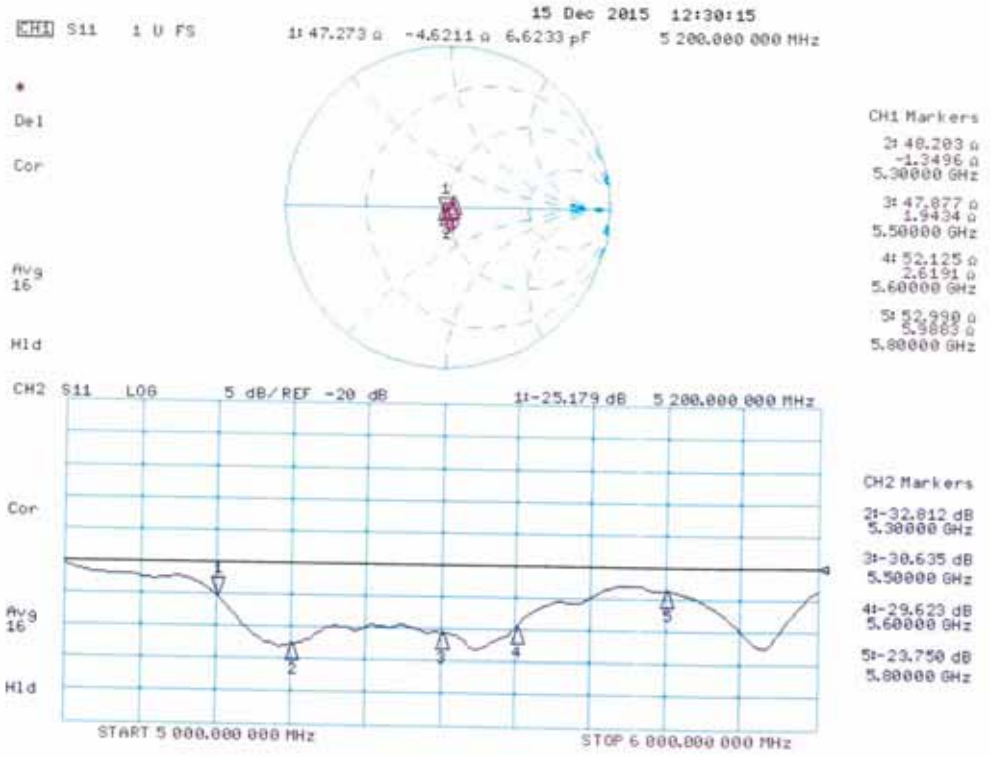
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.47 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 34.8 W/kg
SAR(1 g) = 8.1 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 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 = 65.35 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 35.3 W/kg
SAR(1 g) = 7.78 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 19.4 W/kg



0 dB = 18.0 W/kg = 12.55 dBW/kg

Impedance Measurement Plot for Body TSL



Appendix F. DAE Calibration Data

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

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 Auden **Certificate No:** DAE4-910_Jun15

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BK - SN: 910
Calibration procedure(s)	QA CAL-06.v29 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	June 16, 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
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-14 (No:15573)	Oct-15
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	06-Jan-15 (in house check)	In house check: Jan-16
Calibrator Box V2.1	SE UMS 006 AA 1002	06-Jan-15 (in house check)	In house check: Jan-16

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	

Issued: June 16, 2015

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

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

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

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

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

Calibration Factors	X	Y	Z
High Range	403.340 ± 0.02% (k=2)	402.735 ± 0.02% (k=2)	403.209 ± 0.02% (k=2)
Low Range	3.98320 ± 1.50% (k=2)	3.94315 ± 1.50% (k=2)	3.95091 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	313.5 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200030.76	-3.04	-0.00
Channel X	+ Input	20003.53	-0.70	-0.00
Channel X	- Input	-20003.41	2.00	-0.01
Channel Y	+ Input	200030.80	-2.66	-0.00
Channel Y	+ Input	20002.21	-1.94	-0.01
Channel Y	- Input	-20005.59	-0.15	0.00
Channel Z	+ Input	200031.22	-2.24	-0.00
Channel Z	+ Input	20001.69	-2.33	-0.01
Channel Z	- Input	-20006.57	-1.20	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.93	0.16	0.01
Channel X	+ Input	200.95	0.25	0.13
Channel X	- Input	-198.81	0.29	-0.15
Channel Y	+ Input	2001.23	0.57	0.03
Channel Y	+ Input	200.25	-0.44	-0.22
Channel Y	- Input	-199.52	-0.28	0.14
Channel Z	+ Input	2001.45	0.84	0.04
Channel Z	+ Input	199.43	-1.22	-0.61
Channel Z	- Input	-200.62	-1.41	0.71

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-13.10	-15.14
	- 200	16.68	15.07
Channel Y	200	5.94	5.81
	- 200	-7.93	-7.78
Channel Z	200	-10.97	-10.91
	- 200	9.13	9.10

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	6.10	-2.04
Channel Y	200	10.36	-	6.39
Channel Z	200	9.83	8.23	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	16192	16267
Channel Y	15391	17212
Channel Z	16709	15382

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-1.54	-3.07	0.14	0.70
Channel Y	0.56	-0.66	1.83	0.57
Channel Z	-0.62	-2.23	0.78	0.60

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	–0.01	-8	-9