SAR Test Report

Product Name : Mobile Phone

Model No. : LT40

FCC ID : QRP-AZUMILT40

Applicant : AZUMI S.A

Address : Avenida Aquilino de la Guardia con Calle 47, PH Ocean Plaza, Piso 16 of. 16-01, Marbella, Ciudad de Panamá City, Rep. Panamá

Date of Receipt : Jan. 16, 2015

Date of Test : Jan. 16, 2015

Issued Date : Feb. 27, 2015

Report No. : 1510324R-HP-US-P03V01

Report Version : V1.2

Note: The report is only for LTE Band 7 SAR according to the requirement of the manufacturer, so the simultaneous transmissions are not taken into account.

The test results relate only to the samples tested.
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Test Report Certification

Issued Date: Feb. 27, 2015
Report No.: 1510324R-HP-US-P03V01

QuieTek

Product Name	:	Mobile Phone
Applicant	:	AZUMI S.A
Address	:	Avenida Aquilino de la Guardia con Calle 47, PH Ocean Plaza, Piso 16 of. 16-01, Marbella, Ciudad de Panamá City, Rep. Panamá
Manufacturer	:	AZUMI (HK) LTD
Address	:	FLAT/RM 18 BLK 1 14/F GOLDEN INDUSTRIAL BUILDING 16-26 KWAI TAK STREET KWAI CHUNG
Model No.	:	LT40
FCC ID	:	QRP-AZUMILT40
EUT Voltage	:	DC 3.7V
Applicable Standard	:	IEEE Std. 1528-2013, 47CFR § 2.1093 FCC KDB Publication 447498 D01v05r02 FCC KDB Publication 648474 D04v01r02 FCC KDB Publication 865664 D01v01r03 FCC KDB Publication 941225 D01,D05 and D06
Test Result	:	Max. SAR Measurement (1g) Head: 0.0561 W/kg; Body worn: 0.0658 W/kg Hotspot: 0.422 W/kg;
Performed Location	:	Suzhou EMC Laboratory No.99 Hongye Rd., Suzhou Industrial Park Loufeng Hi-Tech Development Zone., Suzhou, China TEL: +86-512-6251-5088 / FAX: +86-512-6251-5098 FCC Registration Number: 800392
Documented By	:	Alice Ni
Reviewed By	:	Dream Cao
Approved By	:	Jeff Chen

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:

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Germany	**:**	**TUV Rheinland**
Norway	**:**	**Nemko, DNV**
USA	**:**	**FCC**
Japan	**:**	**VCCI**
China	**:**	**CNAS**

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The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/
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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1510324R-HP-US-P03V01	V1.0	Initial Issued Report	Feb. 04, 2015
1510324R-HP-US-P03V01	V1.1	Modified the conducted power	Feb. 04, 2015
1510324R-HP-US-P03V01	V1.2	Revised EUT information and SAR test plots.	Feb. 27, 2015

1. General Information

1.1. EUT Description

Product Name	Mobile Phone
Model No.	LT40
IMEI	862240021000616
Device Category	Portable
EUT Category	Identical prototype
RF Exposure Environment	Uncontrolled
Antenna Type	Internal
GPS	
Class of SRD	Class 3
2G	
Support Band	GSM850/PCS1900
GPRS Class	Class 12
Uplink	GSM 850: 824~849MHz PCS 1900: 1850~1910MHz
Downlink	GSM 850: 869~894MHz PCS 1900: 1930~1990MHz
Release Version	R99
Type of modulation	GMSK for GSM/GPRS 8PSK for EDGE
Antenna Gain	GSM 850: -2.0dBi PCS1900: -0.1dBi
3G	
Support Band	WCDMA Band II/ WCDMA Band V
Uplink	WCDMA Band II: 1852.4~1907.6MHz WCDMA Band V: 826.4~846.6MHz
Downlink	WCDMA Band II: 1932.4~1987.6MHz WCDMA Band V: 871.4~891.6MHz
Release Version	Rel-6
Type of modulation	QPSK for Uplink
Antenna Gain	WCDMA Band V: -2.0dBi WCDMA Band II: -0.1dBi
4G	
Support Band	Band II/IV/VII
Uplink	Band II: 1850~1910MHz

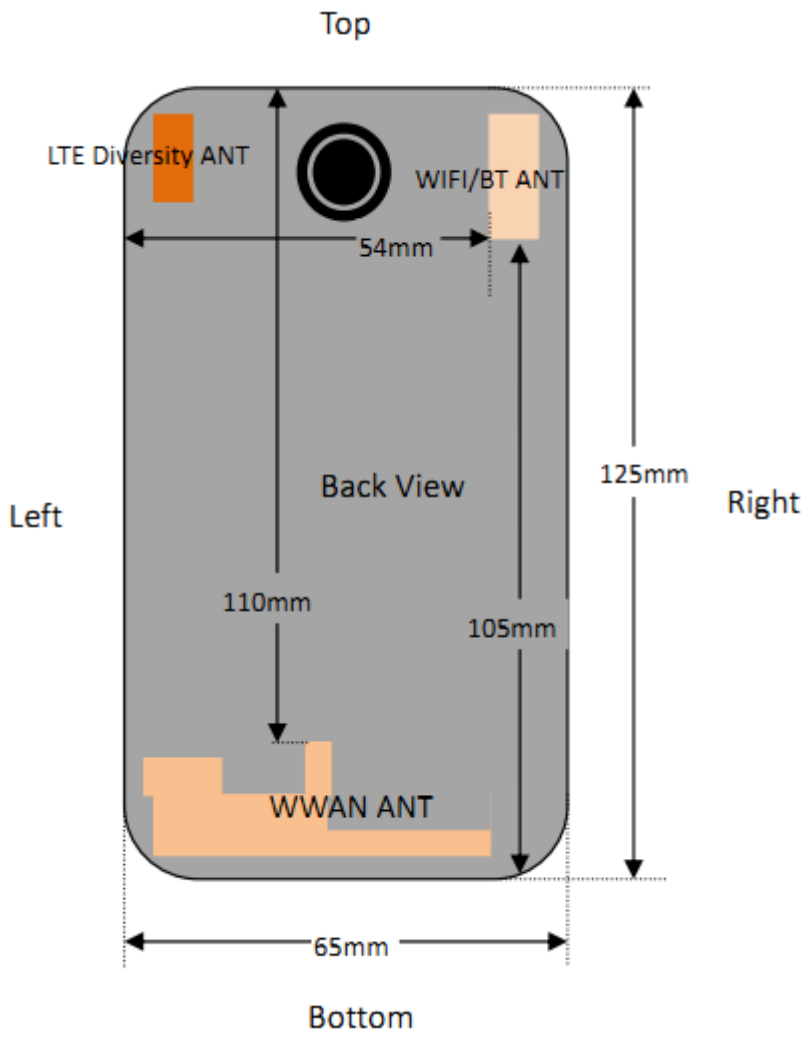
	Band IV: 1710~1755MHz Band VII: 2500~2570MHz
Downlink	Band II: 1930~1990MHz Band IV: 2110~2155MHz Band VII: 2620~2690MHz
Type of modulation	QPSK/16QAM
Antenna Gain	Band II: -0.1dBi Band IV: -0.7dBi Band VII: 0.5dBi
WIFI	
Frequency	2412MHz~2462MHz (802.11b/802.11g/802.11n(H20)) 2422MHz~2452MHz (802.11n(H40))
Type of modulation	802.11b: DSSS; 802.11g/n: OFDM
Data Rate	802.11b: 11 Mbps 802.11g: 54 Mbps 802.11n: up to 150 Mbps
Antenna Gain	2.3dBi
Bluetooth	
Bluetooth Frequency	2402MHz~2480MHz
Bluetooth Version	4.0+HS
Type of modulation	V3.0+HS: GFSK, Pi/4 DQPSK, 8DPSK V4.0: GFSK
Data Rate	V3.0+HS: 1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps (8DPSK) V4.0: 1Mbps(GFSK)
Antenna Gain	2.3dBi
Components	
Battery	Rated Voltage and Capacitance: 3.8V/1450mAh

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
LTE Band VII	Yes	Yes	No	Yes	Yes	Yes

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 D06v01r01 guidance, page 2. The antenna photo shows the distances between the transmit antennas and the edges of the device.

1.4. Power Reduction for SAR

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

1.5. Max Power Reduction for SAR

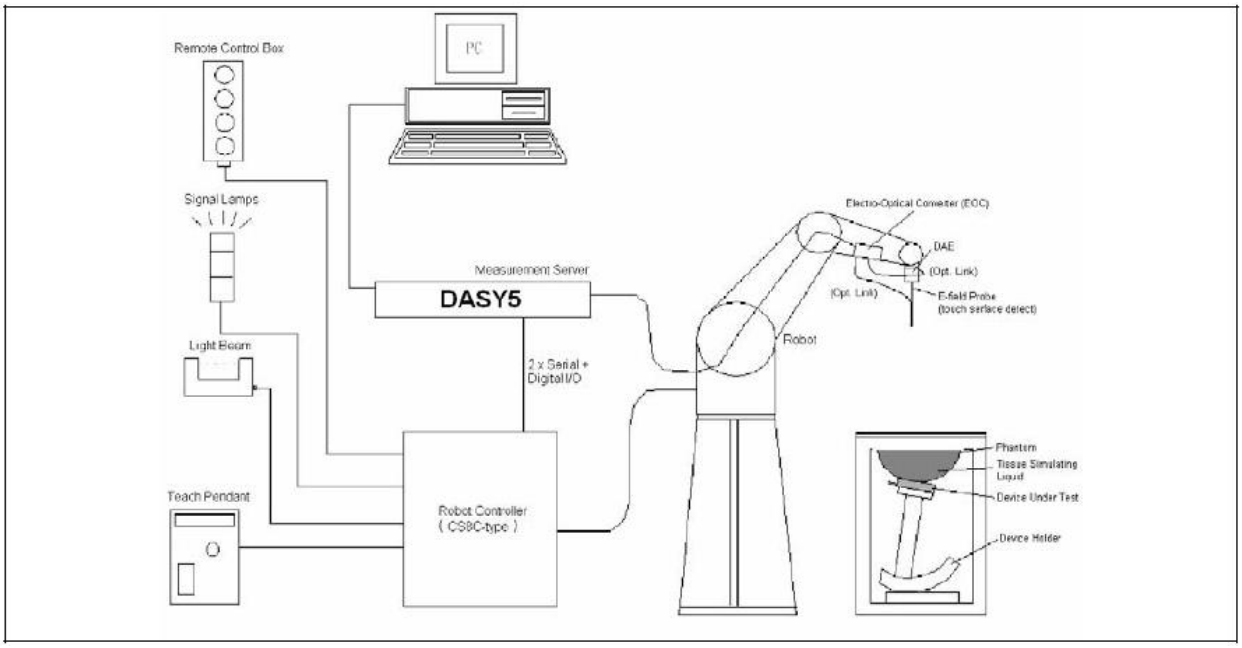
MPR is not supported.

1.6. Guidance Documents

1) FCC KDB Publication 941225 D01,D05 and D06 (2G, 3G and Hotspot)
2) FCC KDB Publication 447498 D01v05r02(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)

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

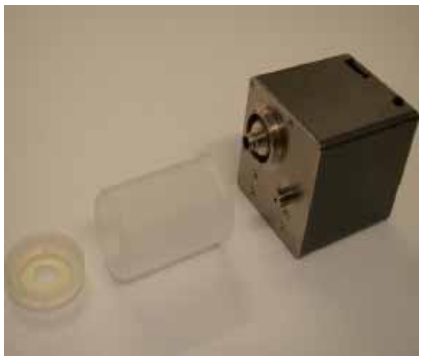
The SAR measurement is conducted with the dosimetric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.
SPEAG conducts the probe calibration in compliance 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%.	

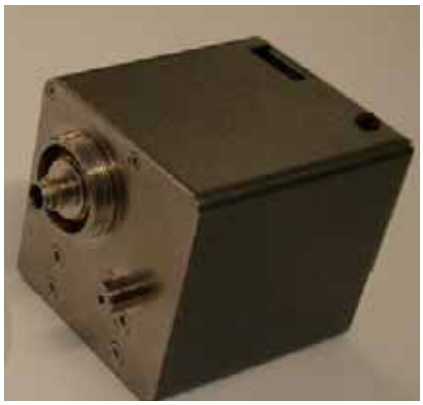
2.3. Boundary Detection Unit and Probe Mounting Device

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)	2600MHz Head	2600MHz Body
Water	55.242	64.493
Salt	0.306	0.024
Sugar	0.00	0.00
HEC	0.00	0.00
Preventol	0.00	0.00
DGBE	44.452	32.252
Triton X-100	0.00	0.00

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]	
2600 MHz	Reference result ± 5% window	39.0 37.05 to 40.95	1.96 1.86 to 2.06	N/A
	01-16-2015	39.22	2.02	21.0

Body Tissue Simulant Measurement				
Frequency [MHz]	Description	Dielectric Parameters		Tissue Temp. [°C]
		ε_r	σ [s/m]	
2600MHz	Reference result ± 5% window	52.5 49.88 to 55.12	2.16 2.05 to 2.27	N/A
	01-16-2015	51.1	2.13	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.

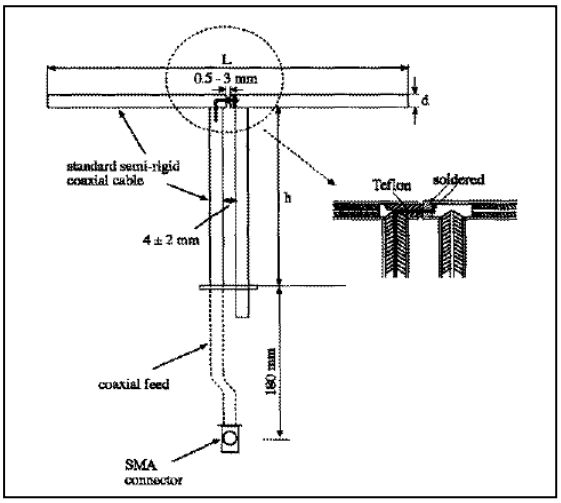
Target Frequency	Head		Body	
(MHz)	ε_r	σ (S/m)	ε_r	σ (S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800 – 2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	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)
2600MHz	49.2	290.0	3.6

4.1.2. Validation Result

System Performance Check at 2600MHz for Head.

Validation Dipole: D2600V2, SN: 1029

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
2600 MHz	Reference result ± 10% window	57.8 52.02 to 63.58	26.0 23.4 to 28.6	N/A
	01-16-2015	56.0	23.80	21.0

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

System Performance Check at 2600MHz for Body

Validation Dipole: D2600V2, SN: 1029

Frequency [MHz]	Description	SAR [w/kg] 1g	SAR [w/kg] 10g	Tissue Temp. [°C]
2600 MHz	Reference result ± 10% window	56.5 50.85 to 62.15	25.0 22.5 to 27.5	N/A
	01-16-2015	54.10	23.32	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 v05r02 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 D01v05r02 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.

4.5. SAR Measurement Conditions for UMTS

4.5.1. Output Power Verification

Maximum output power is measured on the High, Middle and Low channels for each applicable transmission band according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1s".

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121 (release 5), using the appropriate RMC with TPC (transmit power control) set to all "1s" or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

4.5.2. Head SAR Measurements for Handsets

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all "1s". SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than 0.25 dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

4.5.3. Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all "1s".

4.5.4. SAR Measurements for Handsets with Rel 5 HSDPA

Body SAR for HSDPA is not required for handsets with HSDPA capabilities when the maximum average output power of each RF channel with HSDPA active is less than 0.25 dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75% of the SAR limit. Otherwise, SAR is measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration measured in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that resulted in the highest SAR in 12.2 kbps RMC mode for that RF channel.

The H-set used in FRC for HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HSPDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the applicable H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the FRC for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 2 ms to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors of βc=9 and βd=15, and power offset parameters of ΔACK= ΔNACK =5 and ΔCQI=2 is used. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the FRC.

4.5.5. SAR Measurements for Handsets with Rel 6 HSUPA

Body SAR for HSUPA is not required when the maximum average output of each RF channel with HSUPA/HSDPA active is less than 0.25 dB higher than as measured without HSUPA/HSDPA using 12.2 kbps RMC and maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Otherwise SAR is measured on the maximum output channel for the body exposure configuration produced highest SAR in 12.2 kbps RMC for that RF channel, using the additional procedures under “Release 6 HSPA data devices”

Head SAR for VOIP operations under HSPA is not required when maximum average output of each RF channel with HSPA is less than 0.25 dB higher than as measured using 12.2 kbps RMC. Otherwise SAR is measured using same HSPA configuration as used for body SAR.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs}(1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM(2) (dB)	MPR (dB)	AG(4) Index	E-TFCI
1	11/15(3)	15/15(3)	64	11/15(3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}: 47/15 β_{ed2}: 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15(4)	15/15(4)	64	15/15(4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

4.6. SAR Measurement Conditions for LTE

4.6.1. Largest channel bandwidth standalone SAR test requirements

4.6.1.1. QPSK with 1 RB allocation

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.

When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

4.6.1.2. QPSK with 50% RB allocation

The procedures required for 1 RB allocation in section 4.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.

4.6.1.3. QPSK with 100% RB allocation

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in sections 4.2.1 and 4.2.2 are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

4.6.1.4. Higher order modulations

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in sections 4.2.1, 5.2.2 and 4.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

4.6.2. Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section 4.2 to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the

largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg. The equivalent channel configuration for the RB allocation, RB offset and modulation etc. is determined for the smaller channel bandwidth
according to the same number of RB allocated in the largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5 MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing.

4.6.3. Simultaneous transmission SAR test considerations for LTE

Standalone SAR results of the individual transmitters and antennas for the frequency bands, operating modes, device operating configurations and exposure conditions are applied to determine simultaneous transmission SAR test requirements, with respect to the applicable published RF exposure KDB procedures; for example, voice and data modes in LTE, 1xRTT, WCDMA, GSM, EvDo, HSPA, GPRS/EDGE, WiMax, Wi-Fi, Bluetooth etc. The SAR test reduction and exclusion provisions in KDB 447498 should be applied separately for head, body-worn accessory and other use test conditions according to the channel bandwidths, modulations, RB offsets and allocations in each frequency band.

The conditions and configurations that qualify for test exclusion or reduction must be clearly described in the SAR report. When simultaneous transmission SAR measurement is required, the enlarged zoom scan measurement and volume scan post-processing procedures in KDB 865664 must be applied, in conjunction with the published RF exposure KDB procedures required for the product platform and wireless technologies, to each device operating configuration and exposure condition.

Depending on the different combinations of channel bandwidths, modulations, maximum output variations among RB configurations, when LTE devices transmit simultaneously with other wireless modes (for example, Wi-Fi, which has even more data rate, modulation and frequency band combinations), the simultaneous transmission configurations can become very complicated, to the extent that it would be very difficult to develop test procedures to cover all circumstances. When it is unclear, a KDB inquiry should be considered to clarify the test plan or any test concerns to avoid issues during equipment approval.

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	D2600V2	1029	2016.02.23
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	914	2015.12.15
E-Field Probe	Speag	EX3DV4	3710	2015.03.03
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	Anritsu	MT8820C	6201181503	2015.08.12
Vector Network	Agilent	E5071C	MY48367267	2015.03.28
Signal Generator	Agilent	E4438C	MY49070163	2015.03.28
Power Meter	Anritsu	ML2495A	0905006	2015.11.01
Wide Bandwidth Sensor	Anritsu	MA2411B	0846014	2015.11.01

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.	(c_i) 1g	(c_i) 10g	Std. Unc. (1g)	Std. Unc. (10g)	(v_i) v_{eff}
Measurement System								
Probe Calibration	±6.0%	N	1	1	1	±6.0%	±6.0%	∞
Axial Isotropy	±4.7%	R	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	$\sqrt{3}$	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Test Sample Related								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0%	R	$\sqrt{3}$	0.64	0.43	±1.8%	±1.2%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.64	0.43	±1.6%	±1.1%	∞
Liquid Permittivity (target)	±5.0%	R	$\sqrt{3}$	0.6	0.49	±1.7%	±1.4%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.6	0.49	±1.5%	±1.2%	∞
Combined Std. Uncertainty						±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	$\sqrt{3}$	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	$\sqrt{3}$	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±2.0%	R	$\sqrt{3}$	1	1	±1.2%	±1.2%	∞
Linearity	±4.7%	R	$\sqrt{3}$	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	$\sqrt{3}$	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	$\sqrt{3}$	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	$\sqrt{3}$	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.8%	R	$\sqrt{3}$	1	1	±0.5%	±0.5%	∞
Probe Positioning	±9.9%	R	$\sqrt{3}$	1	1	±5.7%	±5.7%	∞
Max. SAR Eval.	±4.0%	R	$\sqrt{3}$	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	$\sqrt{3}$	1	1	±2.9%	±2.9%	∞
Phantom and Setup								
Phantom Uncertainty	±4.0%	R	$\sqrt{3}$	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0%	R	$\sqrt{3}$	0.64	0.43	±1.8%	±1.2%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.64	0.43	±1.6%	±1.1%	∞
Liquid Permittivity (target)	±5.0%	R	$\sqrt{3}$	0.6	0.49	±1.7%	±1.4%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.6	0.49	±1.5%	±1.2%	∞
Combined Std. Uncertainty						±12.8%	±12.6%	330
Expanded STD Uncertainty						±25.6%	±25.2%	

8. Conducted Power Measurement

LTE Band VII

Frequency [MHz]	Uplink Channel Number	BW [MHz]	RB Size	RB Offset	Mod	Maximum Average Power [dBm]	Max. Power (dBm)	Scaling Factor
2510	20850	20	1	0	QPSK	23.67	24.0	1.079
2510	20850	20	1	49		23.63	24.0	1.089
2510	20850	20	1	99		23.43	24.0	1.140
2510	20850	20	50	0		22.88	23.0	1.028
2510	20850	20	50	24		22.82	23.0	1.042
2510	20850	20	50	49		22.74	23.0	1.062
2510	20850	20	100	0		22.81	23.0	1.045
2510	20850	20	1	0	16-QAM	22.73	23.0	1.064
2510	20850	20	1	49		22.75	23.0	1.059
2510	20850	20	1	99		22.45	23.0	1.135
2510	20850	20	50	0		21.77	22.0	1.054
2510	20850	20	50	24		21.65	22.0	1.084
2510	20850	20	50	49		21.58	22.0	1.102
2510	20850	20	100	0		21.59	22.0	1.099
2507.5	20825	15	1	0	QPSK	23.62	24.0	1.091
2507.5	20825	15	1	37		23.65	24.0	1.084
2507.5	20825	15	1	74		23.52	24.0	1.117
2507.5	20825	15	36	0		22.87	23.0	1.030
2507.5	20825	15	36	18		22.78	23.0	1.052
2507.5	20825	15	36	37		22.68	23.0	1.076
2507.5	20825	15	75	0		22.80	23.0	1.047
2507.5	20825	15	1	0	16-QAM	22.55	23.0	1.109
2507.5	20825	15	1	37		22.83	23.0	1.040
2507.5	20825	15	1	74		22.55	23.0	1.109
2507.5	20825	15	36	0		21.67	22.0	1.079
2507.5	20825	15	36	18		21.59	22.0	1.099
2507.5	20825	15	36	37		21.52	22.0	1.117
2507.5	20825	15	75	0		21.62	22.0	1.091
2505	20800	10	1	0	QPSK	23.48	24.0	1.127
2505	20800	10	1	24		23.70	24.0	1.072
2505	20800	10	1	49		23.51	24.0	1.119

2505	20800	10	25	0		22.89	23.0	1.026
2505	20800	10	25	12		22.81	23.0	1.045
2505	20800	10	25	24		22.77	23.0	1.054
2505	20800	10	50	0		22.89	23.0	1.026
2505	20800	10	1	0		22.72	23.0	1.067
2505	20800	10	1	24		22.80	23.0	1.047
2505	20800	10	1	49		22.62	23.0	1.091
2505	20800	10	25	0	16-QAM	21.74	22.0	1.062
2505	20800	10	25	12		21.67	22.0	1.079
2505	20800	10	25	24		21.62	22.0	1.091
2505	20800	10	50	0		21.72	22.0	1.067
2502.5	20775	5	1	0		23.50	23.5	1.000
2502.5	20775	5	1	12		23.47	23.5	1.007
2502.5	20775	5	1	24		23.41	23.5	1.021
2502.5	20775	5	12	0	QPSK	22.67	23.0	1.079
2502.5	20775	5	12	6		22.65	23.0	1.084
2502.5	20775	5	12	11		22.62	23.0	1.091
2502.5	20775	5	25	0		22.69	23.0	1.074
2502.5	20775	5	1	0		22.34	23.0	1.164
2502.5	20775	5	1	12		22.42	23.0	1.143
2502.5	20775	5	1	24		22.38	23.0	1.153
2502.5	20775	5	12	0	16-QAM	21.52	23.0	1.406
2502.5	20775	5	12	6		22.67	23.0	1.079
2502.5	20775	5	12	11		22.53	23.0	1.114
2502.5	20775	5	25	0		21.51	22.0	1.119
2535	21100	20	1	0		23.29	24.0	1.178
2535	21100	20	1	49		23.33	24.0	1.167
2535	21100	20	1	99		23.30	24.0	1.175
2535	21100	20	50	0	QPSK	22.50	23.0	1.122
2535	21100	20	50	24		22.49	23.0	1.125
2535	21100	20	50	49		22.50	23.0	1.122
2535	21100	20	100	0		22.42	23.0	1.143
2535	21100	20	1	0		22.37	23.0	1.156
2535	21100	20	1	49		22.55	23.0	1.109
2535	21100	20	1	99	16-QAM	22.57	23.0	1.104
2535	21100	20	50	0		21.33	22.0	1.167
2535	21100	20	50	24		21.38	22.0	1.153
2535	21100	20	50	49		21.37	22.0	1.156

2535	21100	20	100	0		21.28	22.0	1.180
2535	21100	15	1	0	QPSK	23.19	24.0	1.205
2535	21100	15	1	37		23.34	24.0	1.164
2535	21100	15	1	74		23.30	24.0	1.175
2535	21100	15	36	0		22.39	23.0	1.151
2535	21100	15	36	18		22.45	23.0	1.135
2535	21100	15	36	37		22.41	23.0	1.146
2535	21100	15	75	0		22.38	23.0	1.153
2535	21100	15	1	0	16-QAM	22.27	23.0	1.183
2535	21100	15	1	37		22.51	23.0	1.119
2535	21100	15	1	74		22.48	23.0	1.127
2535	21100	15	36	0		21.26	22.0	1.186
2535	21100	15	36	18		21.31	22.0	1.172
2535	21100	15	36	37		21.28	22.0	1.180
2535	21100	15	75	0		21.26	22.0	1.186
2535	21100	10	1	0	QPSK	23.21	24.0	1.199
2535	21100	10	1	24		23.29	24.0	1.178
2535	21100	10	1	49		23.16	24.0	1.213
2535	21100	10	25	0		22.40	23.0	1.148
2535	21100	10	25	12		22.36	23.0	1.159
2535	21100	10	25	24		22.38	23.0	1.153
2535	21100	10	50	0		22.41	23.0	1.146
2535	21100	10	1	0	16-QAM	22.35	23.0	1.161
2535	21100	10	1	24		22.54	23.0	1.112
2535	21100	10	1	49		22.43	23.0	1.140
2535	21100	10	25	0		21.29	22.0	1.178
2535	21100	10	25	12		21.28	22.0	1.180
2535	21100	10	25	24		21.29	22.0	1.178
2535	21100	10	50	0		21.35	22.0	1.161
2535	21100	5	1	0	QPSK	23.09	23.5	1.099
2535	21100	5	1	12		23.08	23.5	1.102
2535	21100	5	1	24		23.02	23.5	1.117
2535	21100	5	12	0		22.23	23.0	1.194
2535	21100	5	12	6		22.20	23.0	1.202
2535	21100	5	12	11		22.20	23.0	1.202
2535	21100	5	25	0		22.23	23.0	1.194
2535	21100	5	1	0	16-QAM	22.08	23.0	1.236
2535	21100	5	1	12		22.08	23.0	1.236

2535	21100	5	1	24		22.00	23.0	1.259
2535	21100	5	12	0		21.11	23.0	1.545
2535	21100	5	12	6		21.09	23.0	1.552
2535	21100	5	12	11		21.10	23.0	1.549
2535	21100	5	25	0		21.08	22.0	1.236
2560	21350	20	1	0		23.42	24.0	1.143
2560	21350	20	1	49		23.19	24.0	1.205
2560	21350	20	1	99		23.05	24.0	1.245
2560	21350	20	50	0	QPSK	22.53	23.0	1.114
2560	21350	20	50	24		22.42	23.0	1.143
2560	21350	20	50	49		22.42	23.0	1.143
2560	21350	20	100	0		22.47	23.0	1.130
2560	21350	20	1	0		22.65	23.0	1.084
2560	21350	20	1	49		22.64	23.0	1.086
2560	21350	20	1	99		22.39	23.0	1.151
2560	21350	20	50	0	16-QAM	21.58	22.0	1.102
2560	21350	20	50	24		21.52	22.0	1.117
2560	21350	20	50	49		21.51	22.0	1.119
2560	21350	20	100	0		21.56	22.0	1.107
2562.5	21375	15	1	0		23.29	24.0	1.178
2562.5	21375	15	1	37		23.07	24.0	1.239
2562.5	21375	15	1	74		23.15	24.0	1.216
2562.5	21375	15	36	0	QPSK	22.38	23.0	1.153
2562.5	21375	15	36	18		22.37	23.0	1.156
2562.5	21375	15	36	37		22.43	23.0	1.140
2562.5	21375	15	75	0		22.42	23.0	1.143
2562.5	21375	15	1	0		22.58	23.0	1.102
2562.5	21375	15	1	37		22.56	23.0	1.107
2562.5	21375	15	1	74		22.56	23.0	1.107
2562.5	21375	15	36	0	16-QAM	21.46	22.0	1.132
2562.5	21375	15	36	18		21.46	22.0	1.132
2562.5	21375	15	36	37		21.52	22.0	1.117
2562.5	21375	15	75	0		21.51	22.0	1.119
2565	21400	10	1	0		23.00	24.0	1.259
2565	21400	10	1	24		23.19	24.0	1.205
2565	21400	10	1	49	QPSK	22.85	24.0	1.303
2565	21400	10	25	0		22.33	23.0	1.167
2565	21400	10	25	12		22.38	23.0	1.153

2565	21400	10	25	24		22.42	23.0	1.143
2565	21400	10	50	0		22.38	23.0	1.153
2565	21400	10	1	0		22.33	23.0	1.167
2565	21400	10	1	24		22.63	23.0	1.089
2565	21400	10	1	49		22.30	23.0	1.175
2565	21400	10	25	0	16-QAM	21.38	22.0	1.153
2565	21400	10	25	12		21.45	22.0	1.135
2565	21400	10	25	24		21.50	22.0	1.122
2565	21400	10	50	0		21.47	22.0	1.130
2567.5	21425	5	1	0		23.43	23.5	1.016
2567.5	21425	5	1	12		23.32	23.5	1.042
2567.5	21425	5	1	24		23.39	23.5	1.026
2567.5	21425	5	12	0	QPSK	22.61	23.0	1.094
2567.5	21425	5	12	6		22.55	23.0	1.109
2567.5	21425	5	12	11		22.60	23.0	1.096
2567.5	21425	5	25	0		22.55	23.0	1.109
2567.5	21425	5	1	0		22.60	23.0	1.096
2567.5	21425	5	1	12		22.47	23.0	1.130
2567.5	21425	5	1	24		22.52	23.0	1.117
2567.5	21425	5	12	0	16-QAM	21.52	23.0	1.406
2567.5	21425	5	12	6		21.49	23.0	1.416
2567.5	21425	5	12	11		21.56	23.0	1.393
2567.5	21425	5	25	0		21.55	22.0	1.109

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: Mobile Phone									
Test Mode: LTE Band VII 20MHz Bandwidth QPSK 1RB 0RB Offset									
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	20850	2510	23.67	0.11	0.021	1.079	0.0227	1.6
Left-Tilted	Fixed	20850	2510	23.67	0.06	0.012	1.079	0.0129	1.6
Right-Cheek	Fixed	20850	2510	23.67	-0.09	0.052	1.079	0.0561	1.6
Right-Tilted	Fixed	20850	2510	23.67	0.07	0.024	1.079	0.0259	1.6
Test Mode: LTE Band IV 20MHz Bandwidth QPSK 50%RB 0RB Offset									
Left-Cheek	Fixed	20850	2510	22.88	0.04	0.020	1.028	0.0206	1.6
Left-Tilted	Fixed	20850	2510	22.88	0.12	0.00451	1.028	0.0046	1.6
Right-Cheek	Fixed	20850	2510	22.88	-0.15	0.042	1.028	0.0432	1.6
Right-Tilted	Fixed	20850	2510	22.88	-0.01	0.019	1.028	0.0195	1.6
Note1: when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional, refer to KDB 447498 D01 v05r02.									

SAR MEASUREMENT

Ambient Temperature (°C) : 21.5 ± 2 Relative Humidity (%): 52

Liquid Temperature (°C) : 21.0 ± 2 Depth of Liquid (cm):>15

Product: Mobile Phone

Body-worn Accessory SAR Configurations

Test Mode: LTE Band VII 20MHz Bandwidth QPSK 1RB 0RB Offset

Test Position Body (10mm gap)	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						
Body-worn	Fixed	20850	2510	23.67	-0.05	0.056	1.079	0.0604	1.6
Body-worn	Fixed	21100	2535	23.29	--	--	1.178	--	1.6
Body-worn	Fixed	21350	2560	23.42	--	--	1.143	--	1.6
Test Mode: LTE Band VII 20MHz Bandwidth QPSK 50%RB 0RB Offset									
Body-worn	Fixed	20850	2510	22.88	-0.04	0.064	1.028	0.0658	1.6
Body-worn	Fixed	21100	2535	22.50	--	--	1.122	--	1.6
Body-worn	Fixed	21350	2560	22.53	--	--	1.114	--	1.6
Hotspot SAR Configurations									
Test Mode: LTE Band VII 20MHz Bandwidth QPSK 1RB 0RB Offset									
Back	Fixed	20850	2510	23.67	-0.05	0.056	1.079	0.0604	1.6
Back	Fixed	21100	2535	23.29	--	--	1.178	--	1.6
Back	Fixed	21350	2560	23.42	--	--	1.143	--	1.6
Front	Fixed	20850	2510	23.67	0.12	0.048	1.079	0.0518	1.6
Left side	Fixed	20850	2510	23.67	-0.15	0.013	1.079	0.014	1.6
Right side	Fixed	20850	2510	23.67	0.01	0.033	1.079	0.0356	1.6
Bottom	Fixed	20850	2510	23.67	0.20	**0.391**	1.079	**0.422**	1.6
Test Mode: LTE Band VII 20MHz Bandwidth QPSK 50%RB 0RB Offset									
Back	Fixed	20850	2510	22.88	-0.04	0.064	1.028	0.0658	1.6
Back	Fixed	21100	2535	22.50	--	--	1.122	--	1.6
Back	Fixed	21350	2560	22.53	--	--	1.114	--	1.6
Front	Fixed	20850	2510	22.88	0.15	0.039	1.028	0.040	1.6
Left side	Fixed	20850	2510	22.88	-0.18	0.00889	1.028	0.0091	1.6
Right side	Fixed	20850	2510	22.88	-0.15	0.021	1.028	0.0216	1.6

Bottom	Fixed	20850	2510	22.88	0.13	0.341	1.028	0.351	1.6
Note: when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional, refer to KDB 447498 D01 v05r02.									

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 D06v01r01, 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: 01-16-2015

Test Laboratory: QuieTek Lab

System Check Head 2600MHz

DUT: Dipole 2600 MHz D2600V2; Type: D2600V2

Communication System: UID 0, CW (0); Communication System Band: D2600(2600.0MHz); Duty Cycle: 1:1;

Frequency: 2600 MHz; Medium parameters used: f = 2600 MHz; σ = 2.02 S/m; εr = 39.22; ρ = 1000 kg/m3 ;

Phantom section: Flat Section ; Input Power=250mW

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

DASY5 Configuration:

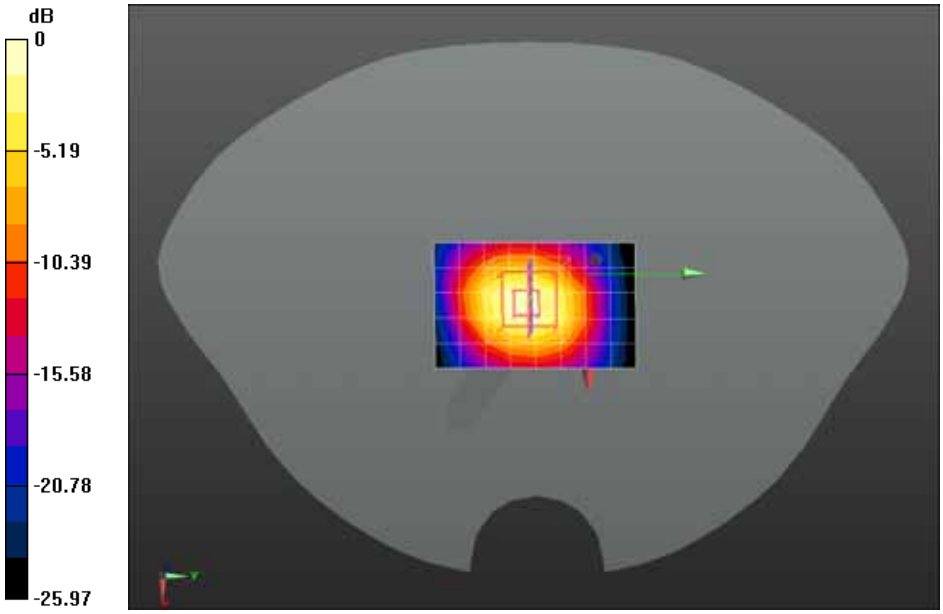
- Probe: EX3DV4 - SN3710; ConvF(6.87, 6.87, 6.87); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/System Check Head 2600MHz/Area Scan (6x9x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (measured) = 12.6 W/kg

Configuration/System Check Head 2600MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm, Reference Value = 86.260 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 33.0 W/kg

SAR(1 g) = 14 W/kg; SAR(10 g) = 5.95 W/kg Maximum value of SAR (measured) = 15.9 W/kg



0 dB = 15.9 W/kg = 12.01 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

System Check Body 2600MHz

DUT: Dipole 2600 MHz D2600V2; Type: D2600V2

Communication System: UID 0, CW (0); Communication System Band: D2600(2600.0MHz); Duty Cycle: 1:1;

Frequency: 2600 MHz; Medium parameters used: f = 2600 MHz; σ = 2.13 S/m; εr = 51.1; ρ = 1000 kg/m3 ;

Phantom section: Flat Section ; Input Power=250mW

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

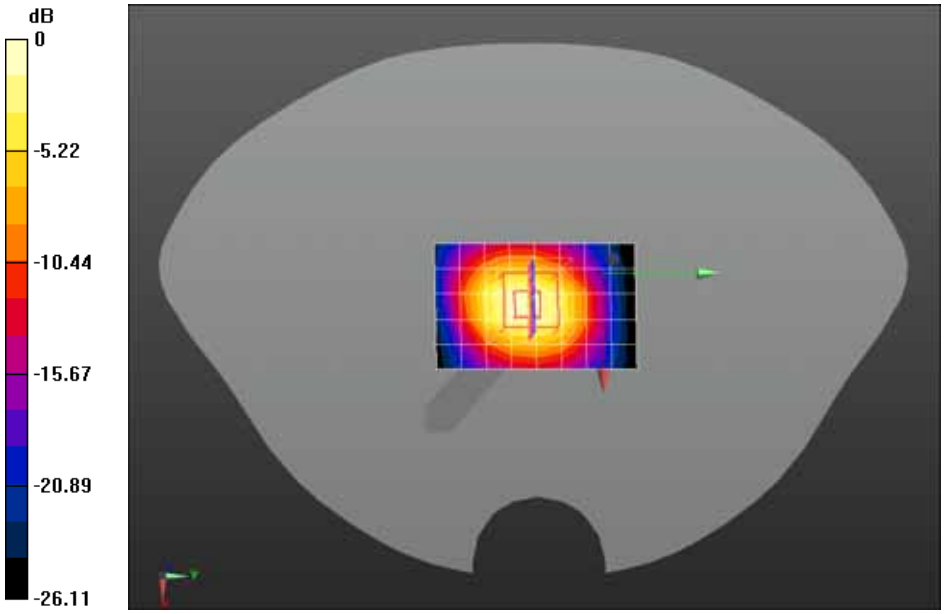
Configuration/System Check Body 2600MHz/Area Scan (6x9x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 12.3 W/kg

Configuration/System Check Body 2600MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm, Reference Value = 82.796 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 32.6 W/kg

SAR(1 g) = 13.7 W/kg; SAR(10 g) = 5.83 W/kg Maximum value of SAR (measured) = 15.6 W/kg



0 dB = 15.6 W/kg = 11.93 dBW/kg

Appendix B. SAR measurement Data

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 1RB#0 Low Channel Touch-Left

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 1.95 S/m; εr = 39.62; ρ = 1000 kg/m3 ; Phantom section: Left Section

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

DASY5 Configuration:

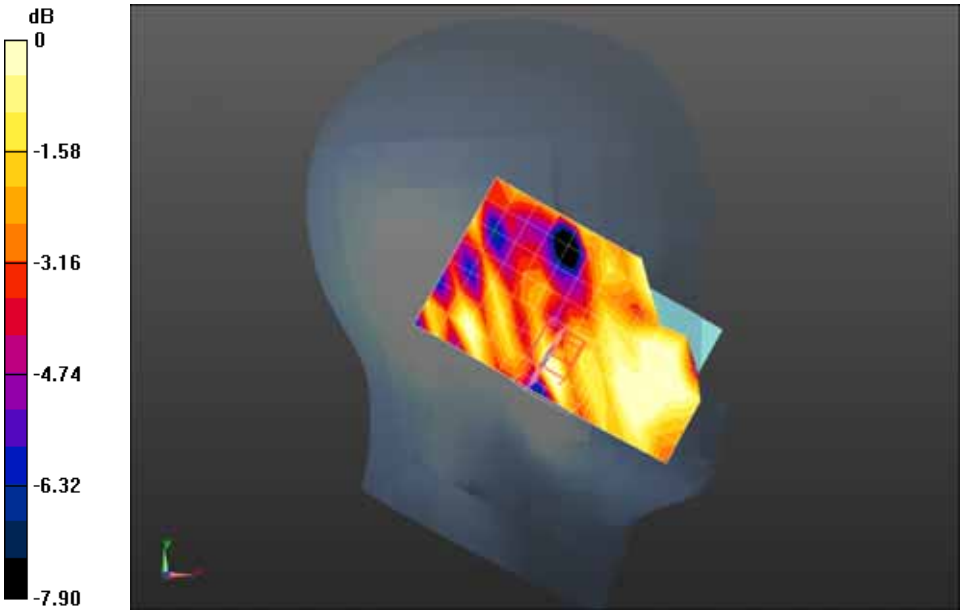
- Probe: EX3DV4 - SN3710; ConvF(6.87, 6.87, 6.87); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Touch-Left/Area Scan (8x13x1): Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.0379 W/kg

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Touch-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 1.128 V/m; Power Drift = 8.31 dB

Peak SAR (extrapolated) = 0.0410 W/kg

SAR(1 g) = 0.021 W/kg; SAR(10 g) = 0.015 W/kg Maximum value of SAR (measured) = 0.0272 W/kg



0 dB = 0.0272 W/kg = -15.65 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 1RB#0 Low Channel Tilt-Left

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 1.95 S/m; εr = 39.62; ρ = 1000 kg/m3 ; Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.87, 6.87, 6.87); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

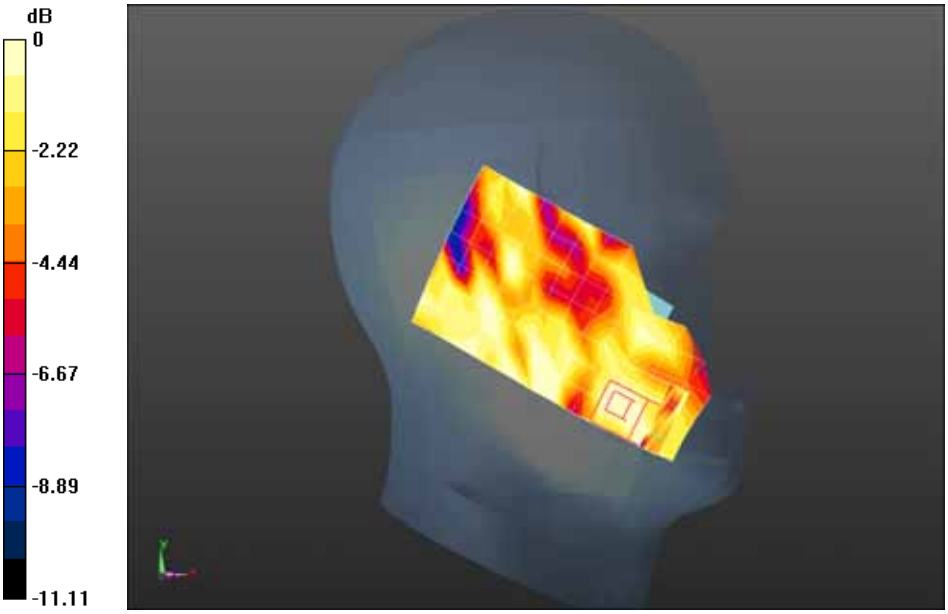
Configuration/LTE Band VII 20M QPSK 1RB#0 Low Tilt-Left/Area Scan (8x13x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0211 W/kg

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Tilt-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 2.212 V/m; Power Drift = 1.86 dB

Peak SAR (extrapolated) = 0.0460 W/kg

SAR(1 g) = 0.012 W/kg; SAR(10 g) = 0.00415 W/kg Maximum value of SAR (measured) = 0.0146 W/kg



0 dB = 0.0146 W/kg = -18.36 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 1RB#0 Low Channel Touch-Right

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 1.95 S/m; εr = 39.62; ρ = 1000 kg/m3 ; Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.87, 6.87, 6.87); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

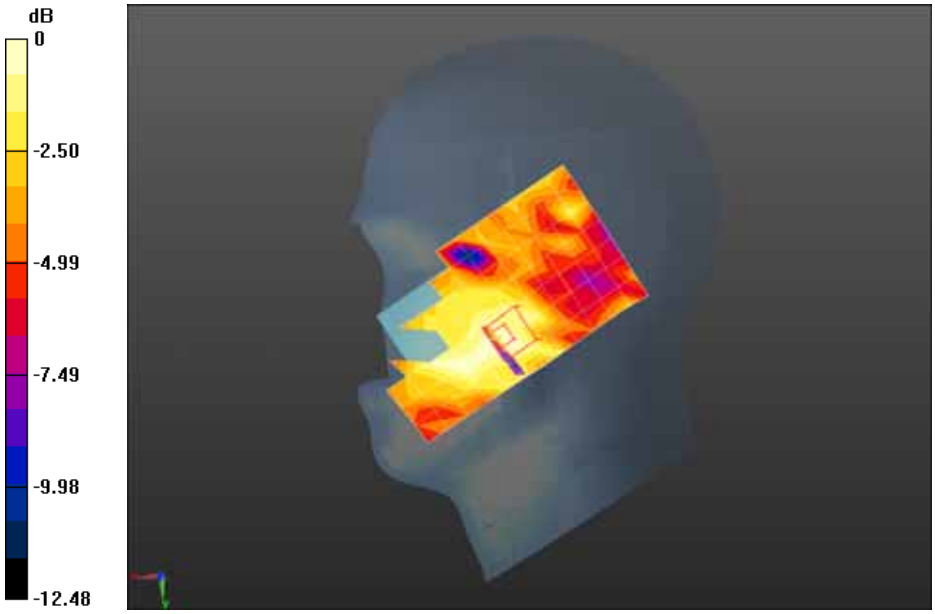
Configuration/LTE Band VII 20M QPSK 1RB#0 Low Touch-Right/Area Scan (8x13x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0607 W/kg

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 3.882 V/m; Power Drift = -6.29 dB

Peak SAR (extrapolated) = 0.0730 W/kg

SAR(1 g) = 0.052 W/kg; SAR(10 g) = 0.032 W/kg Maximum value of SAR (measured) = 0.0561 W/kg



0 dB = 0.0561 W/kg = -12.51 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 1RB#0 Low Channel Tilt-Right

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 1.95 S/m; εr = 39.62; ρ = 1000 kg/m3 ; Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.87, 6.87, 6.87); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Tilt-Right/Area Scan (8x13x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0300 W/kg

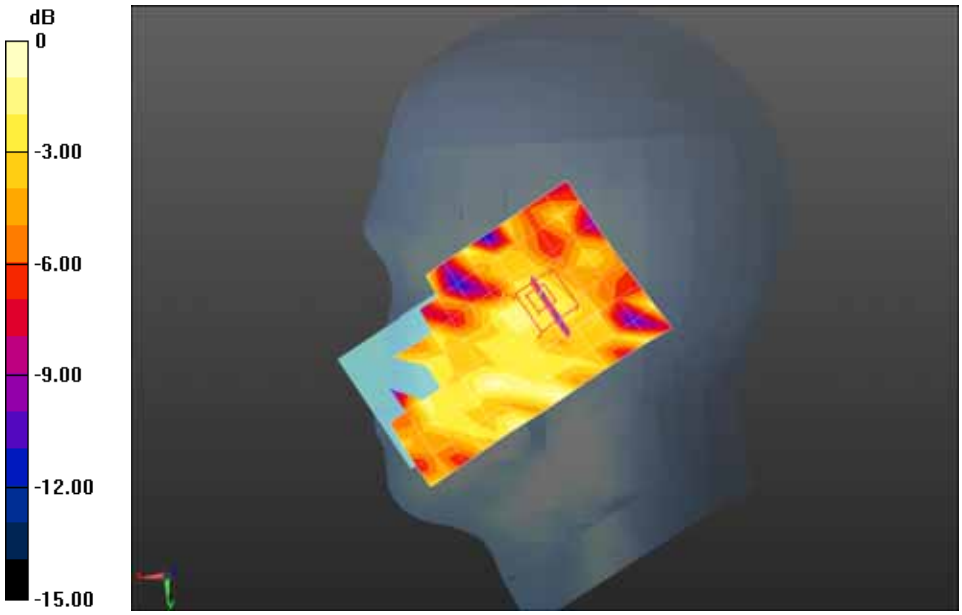
Configuration/LTE Band VII 20M QPSK 1RB#0 Low Tilt-Right/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 2.255 V/m; Power Drift = 0.27 dB

Peak SAR (extrapolated) = 0.0480 W/kg

SAR(1 g) = 0.024 W/kg; SAR(10 g) = 0.012 W/kg

Maximum value of SAR (measured) = 0.0335 W/kg



0 dB = 0.0335 W/kg = -14.75 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 50RB#0 Low Channel Touch-Left

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 50 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 1.95 S/m; εr = 39.62; ρ = 1000 kg/m3 ; Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.87, 6.87, 6.87); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

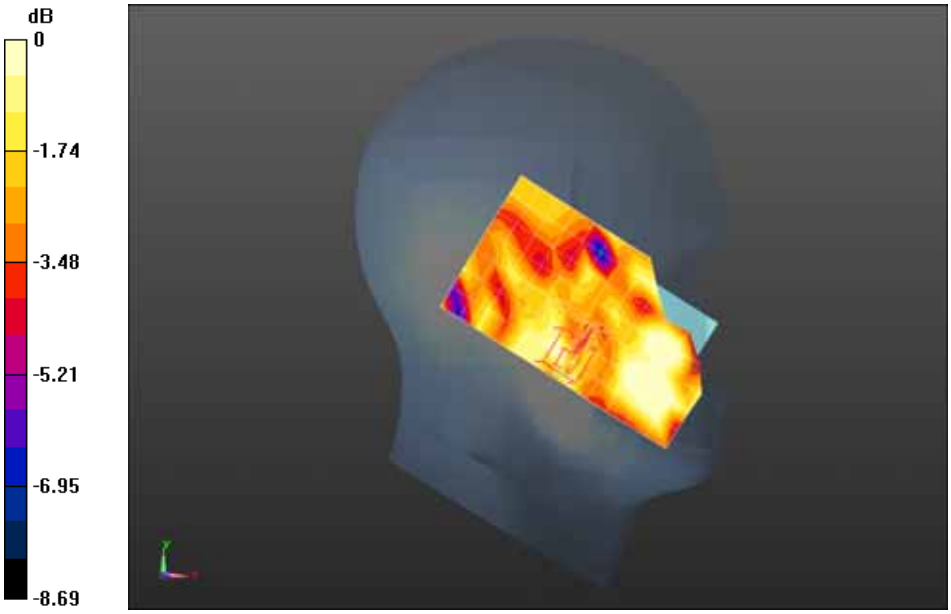
Configuration/LTE Band VII 20M QPSK 50RB#0 Low Touch-Left/Area Scan (8x13x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0320 W/kg

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Touch-Left/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 3.176 V/m; Power Drift = 1.24 dB

Peak SAR (extrapolated) = 0.0510 W/kg

SAR(1 g) = 0.020 W/kg; SAR(10 g) = 0.014 W/kg Maximum value of SAR (measured) = 0.0244 W/kg



0 dB = 0.0244 W/kg = -16.13 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 50RB#0 Low Channel Tilt-Left

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 50 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 1.95 S/m; εr = 39.62; ρ = 1000 kg/m3 ; Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.87, 6.87, 6.87); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Tilt-Left/Area Scan (8x13x1): Measurement grid: dx=12mm, dy=12mm

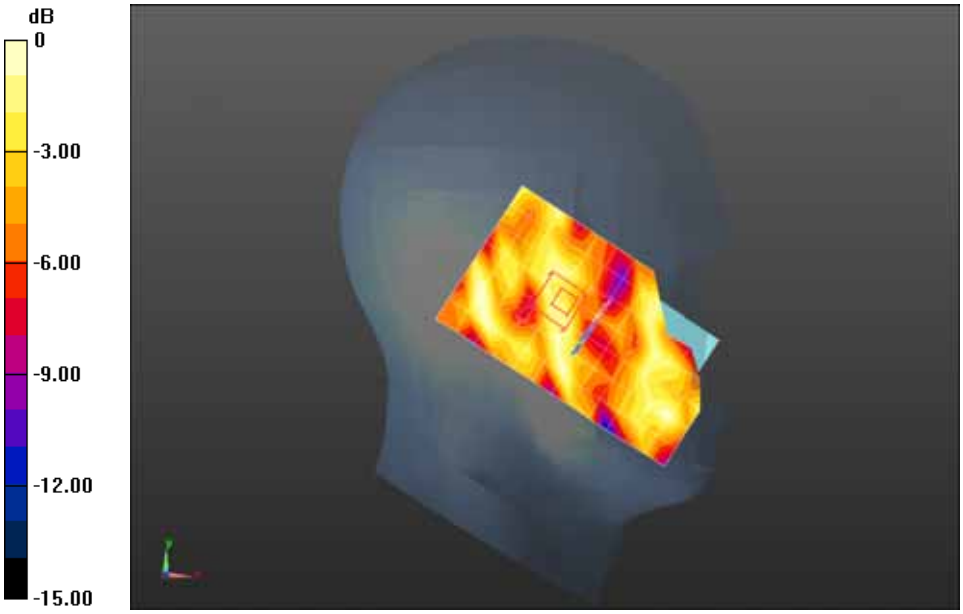
Maximum value of SAR (measured) = 0.0214 W/kg

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Tilt-Left/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 1.650 V/m; Power Drift = 5.32 dB

Peak SAR (extrapolated) = 0.0370 W/kg

SAR(1 g) = 0.00451 W/kg; SAR(10 g) = 0.00091 W/kg Maximum value of SAR (measured) = 0.0186 W/kg



0 dB = 0.0186 W/kg = -17.30 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 50RB#0 Low Touch-Right

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 50 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 1.95 S/m; εr = 39.62; ρ = 1000 kg/m3 ; Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.87, 6.87, 6.87); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

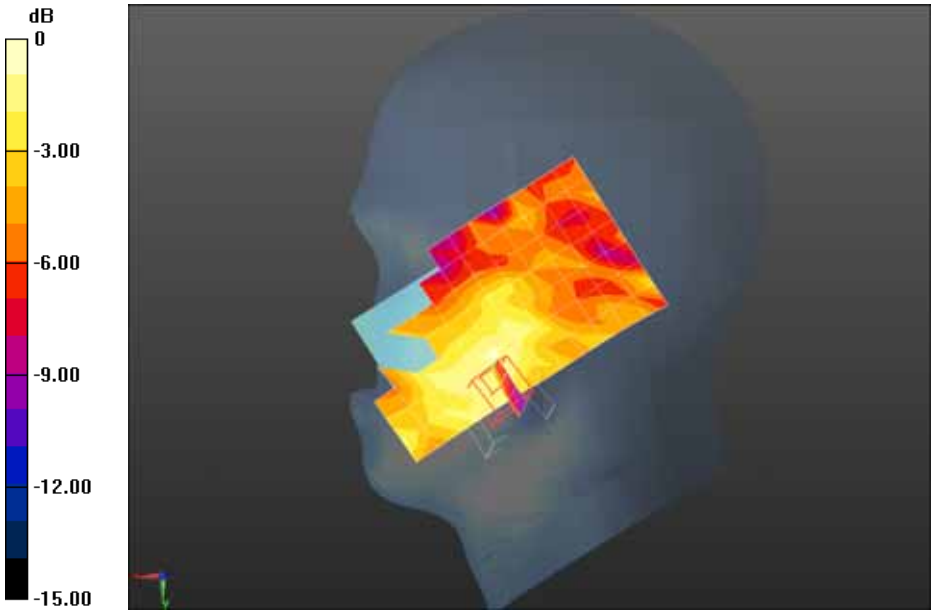
Configuration/LTE Band VII 20M QPSK 50RB#0 Low Touch-Right/Area Scan (8x13x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0495 W/kg

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Touch-Right/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 3.343 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.0870 W/kg

SAR(1 g) = 0.042 W/kg; SAR(10 g) = 0.023 W/kg Maximum value of SAR (measured) = 0.0589 W/kg



0 dB = 0.0589 W/kg = -12.30 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 50RB#0 Low Tilt-Right

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 50 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 1.95 S/m; εr = 39.62; ρ = 1000 kg/m3 ; Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.87, 6.87, 6.87); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM2; Type: SAM; Serial: TP1562
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Tilt-Right/Area Scan (8x13x1): Measurement grid: dx=12mm, dy=12mm

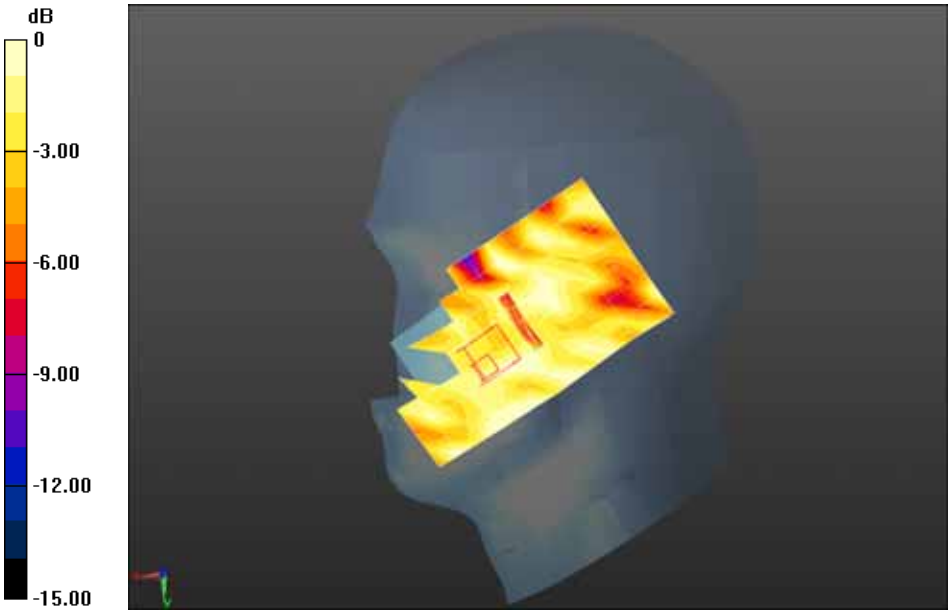
Maximum value of SAR (measured) = 0.0314 W/kg

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Tilt-Right/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 2.446 V/m; Power Drift = -0.41 dB

Peak SAR (extrapolated) = 0.0840 W/kg

SAR(1 g) = 0.019 W/kg; SAR(10 g) = 0.00709 W/kg Maximum value of SAR (measured) = 0.0227 W/kg



0 dB = 0.0227 W/kg = -16.44 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 1RB#0 Low Body-Back

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 2.06 S/m; εr = 51.82; ρ = 1000 kg/m3 ; Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Body-Back/Area Scan (7x13x1): Measurement grid: dx=12mm, dy=12mm

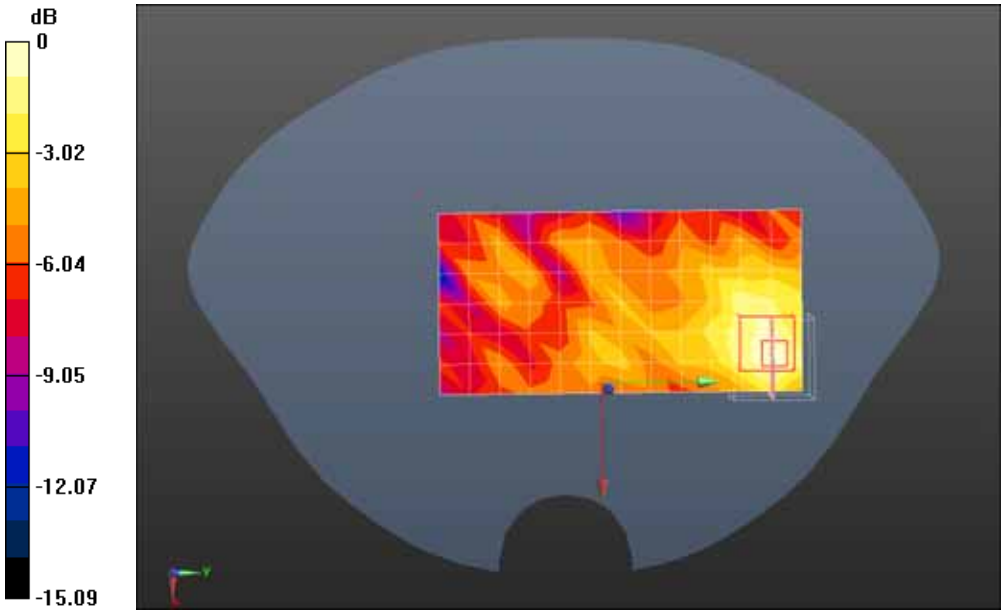
Maximum value of SAR (measured) = 0.0625 W/kg

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Body-Back/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 3.080 V/m; Power Drift = -2.25 dB

Peak SAR (extrapolated) = 0.108 W/kg

SAR(1 g) = 0.056 W/kg; SAR(10 g) = 0.031 W/kg Maximum value of SAR (measured) = 0.0628 W/kg



0 dB = 0.0628 W/kg = -12.02 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 1RB#0 Low Body-Front

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 2.06 S/m; εr = 51.82; ρ = 1000 kg/m3 ; Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Body-Front/Area Scan (7x13x1): Measurement grid: dx=12mm, dy=12mm

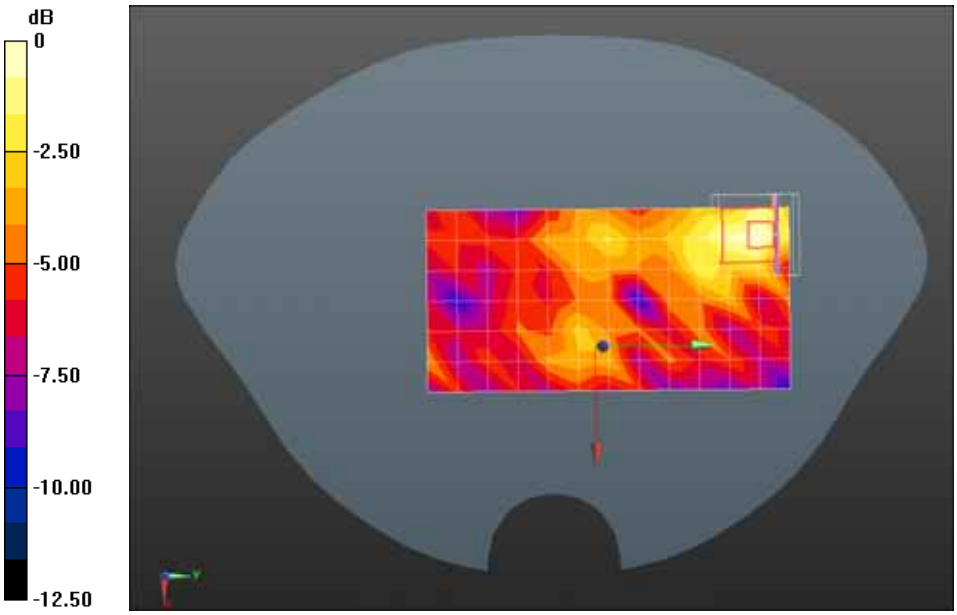
Maximum value of SAR (measured) = 0.0557 W/kg

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Body-Front/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 2.198 V/m; Power Drift = 1.92 dB

Peak SAR (extrapolated) = 0.0860 W/kg

SAR(1 g) = 0.048 W/kg; SAR(10 g) = 0.026 W/kg

Maximum value of SAR (measured) = 0.0560 W/kg



0 dB = 0.0560 W/kg = -12.52 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 1RB#0 Low Body-Left side

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 2.06 S/m; εr = 51.82; ρ = 1000 kg/m3 ; Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

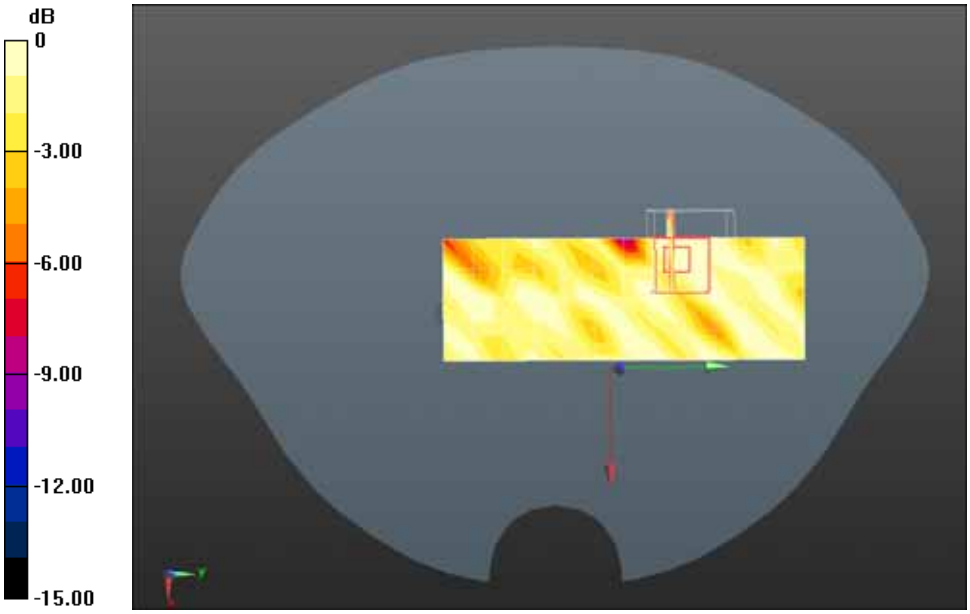
Configuration/LTE Band VII 20M QPSK 1RB#0 Low Body-Left side/Area Scan (5x13x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0184 W/kg

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Body-Left side/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 2.322 V/m; Power Drift = -1.55 dB

Peak SAR (extrapolated) = 0.0610 W/kg

SAR(1 g) = 0.013 W/kg; SAR(10 g) = 0.00453 W/kg Maximum value of SAR (measured) = 0.0148 W/kg



0 dB = 0.0148 W/kg = -18.30 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 1RB#0 Low Body-Right side

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 2.06 S/m; εr = 51.82; ρ = 1000 kg/m3 ; Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Body-Right side/Area Scan (5x13x1):

Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0421 W/kg

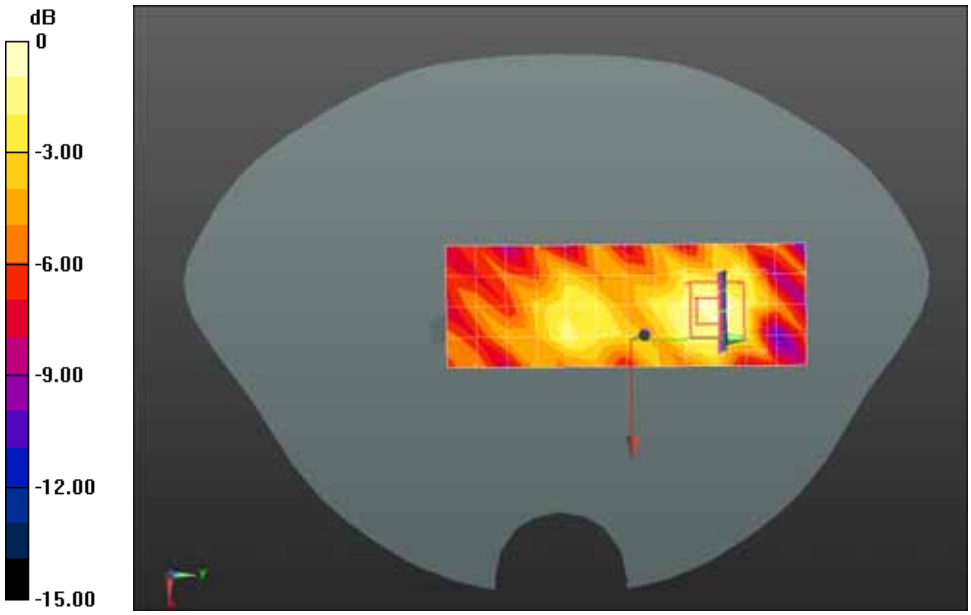
Configuration/LTE Band VII 20M QPSK 1RB#0 Low Body-Right side/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 3.268 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.0580 W/kg

SAR(1 g) = 0.033 W/kg; SAR(10 g) = 0.016 W/kg

Maximum value of SAR (measured) = 0.0410 W/kg



0 dB = 0.0410 W/kg = -13.87 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 1RB#0 Low Body-Bottom

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 2.06 S/m; εr = 51.82; ρ = 1000 kg/m3 ; Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Body-Bottom/Area Scan (5x9x1): Measurement grid: dx=12mm, dy=12mm

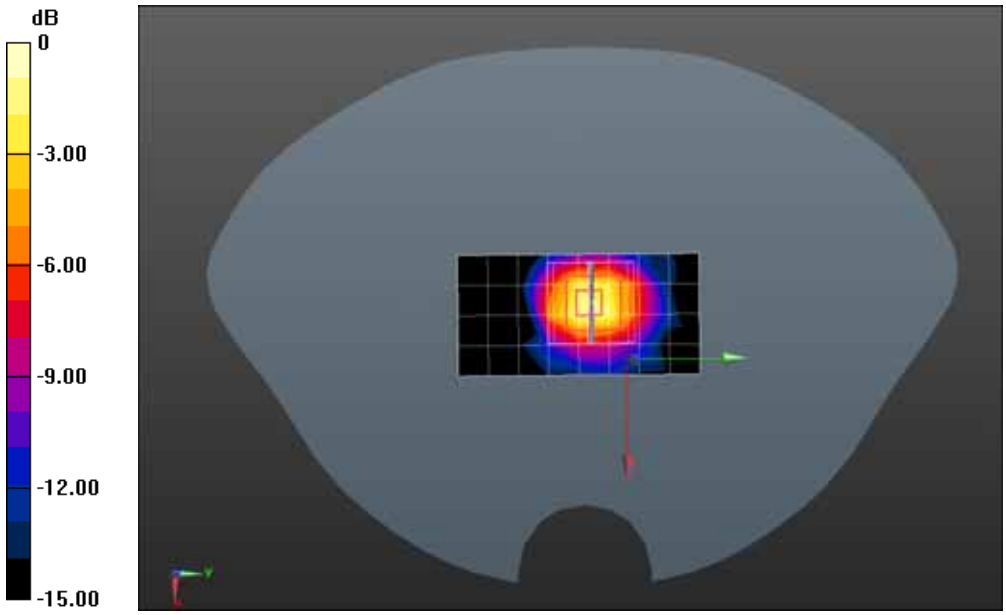
Maximum value of SAR (measured) = 0.352 W/kg

Configuration/LTE Band VII 20M QPSK 1RB#0 Low Body-Bottom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 13.249 V/m; Power Drift = 0.20 dB

Peak SAR (extrapolated) = 0.851 W/kg

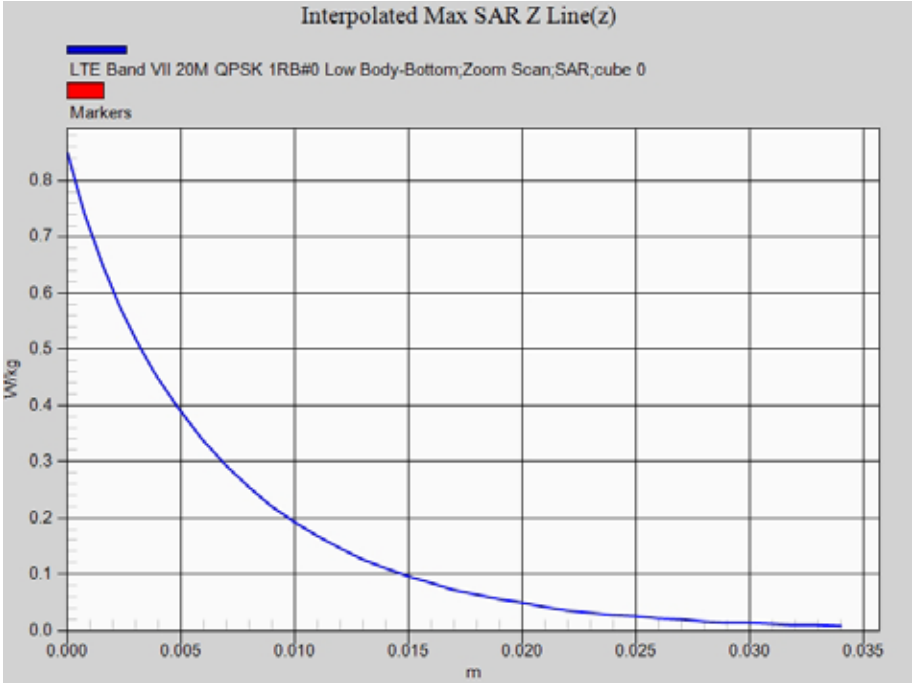
SAR(1 g) = 0.391 W/kg; SAR(10 g) = 0.172 W/kg

Maximum value of SAR (measured) = 0.450 W/kg



0 dB = 0.450 W/kg = -3.47 dBW/kg

Z-Axis Plot


Interpolated Max SAR Z Line(z)
LTE Band VII 20M QPSK 1RB#0 Low Body-Bottom;Zoom Scan;SAR;cube 0
Markers
W/kg
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 50RB#0 Low Body-Back

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 50 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 2.06 S/m; εr = 51.82; ρ = 1000 kg/m3 ; Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

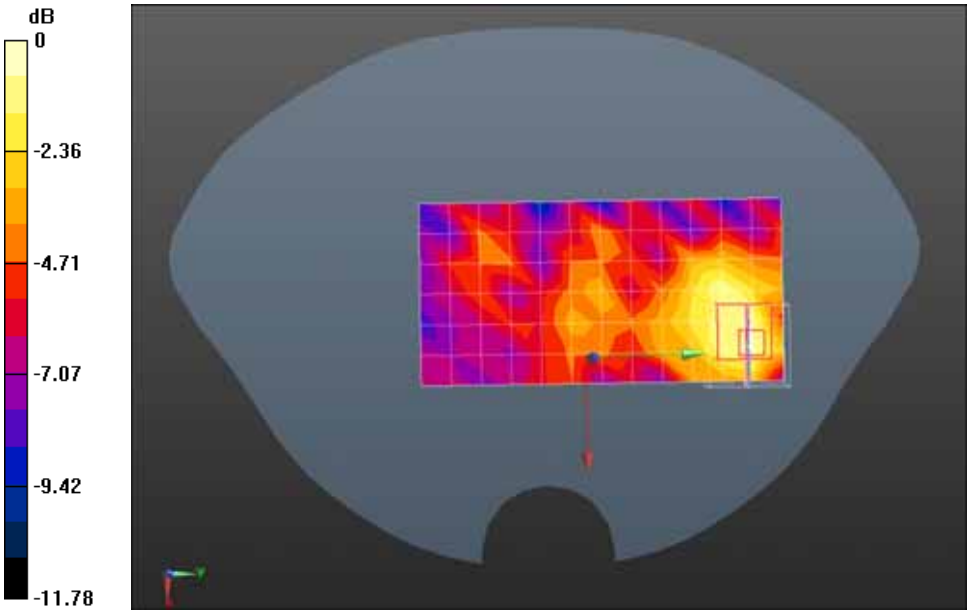
Configuration/LTE Band VII 20M QPSK 50RB#0 Low Body-Back/Area Scan (7x13x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (measured) = 0.0616 W/kg

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Body-Back/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 2.664 V/m; Power Drift = -1.64 dB

Peak SAR (extrapolated) = 0.151 W/kg

SAR(1 g) = 0.064 W/kg; SAR(10 g) = 0.036 W/kg Maximum value of SAR (measured) = 0.0691 W/kg



0 dB = 0.0691 W/kg = -11.61 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 50RB#0 Low Body-Front

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 50 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 2.06 S/m; εr = 51.82; ρ = 1000 kg/m3 ; Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Body-Front/Area Scan (7x13x1): Measurement grid: dx=12mm, dy=12mm

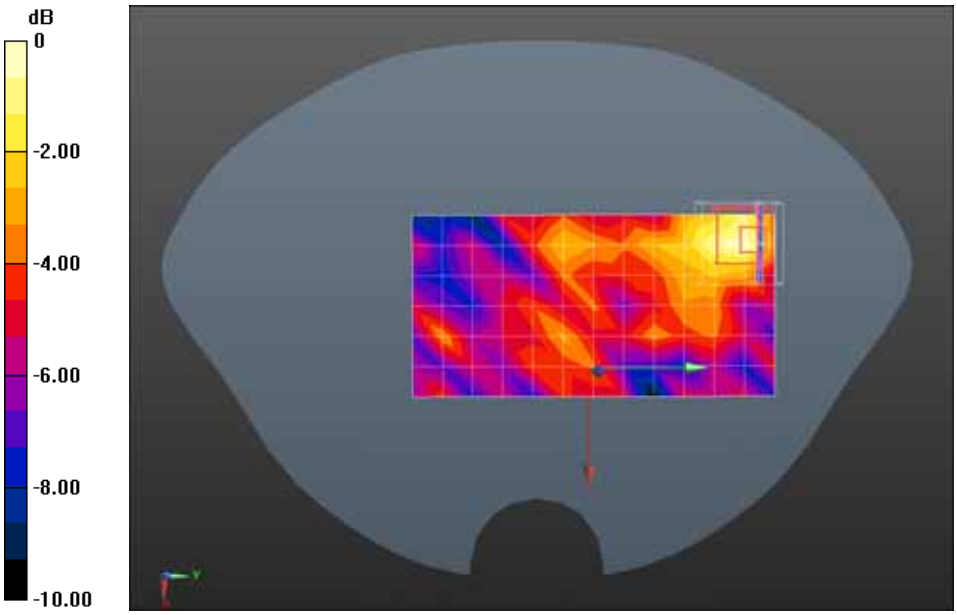
Maximum value of SAR (measured) = 0.0486 W/kg

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Body-Front/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 2.551 V/m; Power Drift = 0.55 dB

Peak SAR (extrapolated) = 0.0730 W/kg

SAR(1 g) = 0.039 W/kg; SAR(10 g) = 0.022 W/kg

Maximum value of SAR (measured) = 0.0500 W/kg



0 dB = 0.0500 W/kg = -13.01 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 50RB#0 Low Body-Left side

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 50 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 2.06 S/m; εr = 51.82; ρ = 1000 kg/m3 ; Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Body-Left side/Area Scan (5x13x1):

Measurement grid: dx=12mm, dy=12mm

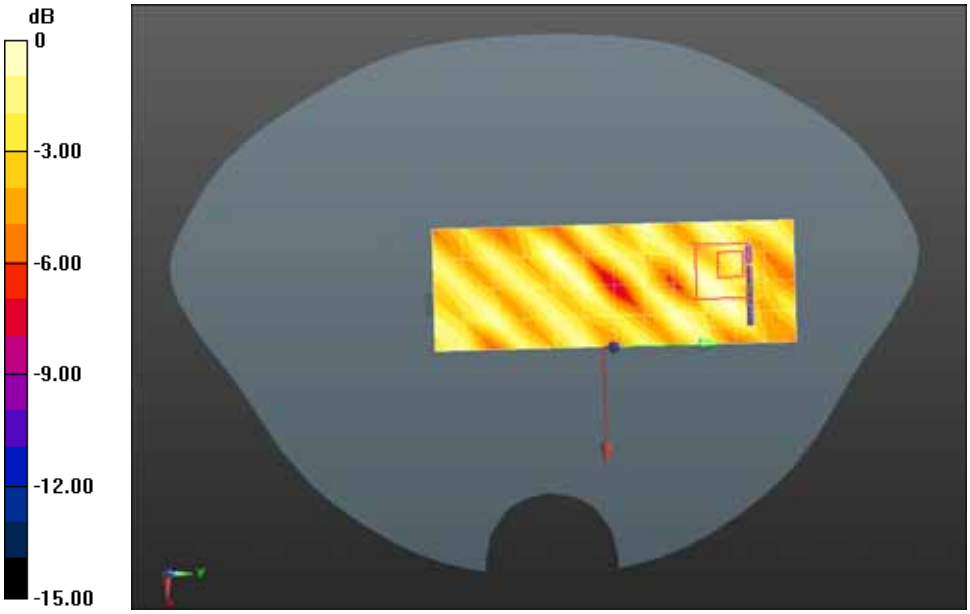
Maximum value of SAR (measured) = 0.0125 W/kg

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Body-Left side/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 1.472 V/m; Power Drift = -2.18 dB

Peak SAR (extrapolated) = 0.0380 W/kg

SAR(1 g) = 0.00889 W/kg; SAR(10 g) = 0.00256 W/kg Maximum value of SAR (measured) = 0.0114 W/kg



0 dB = 0.0114 W/kg = -19.43 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 50RB#0 Low Body-Right side

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 50 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 2.06 S/m; εr = 51.82; ρ = 1000 kg/m3 ; Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Body-Right side/Area Scan (5x13x1):

Measurement grid: dx=12mm, dy=12mm

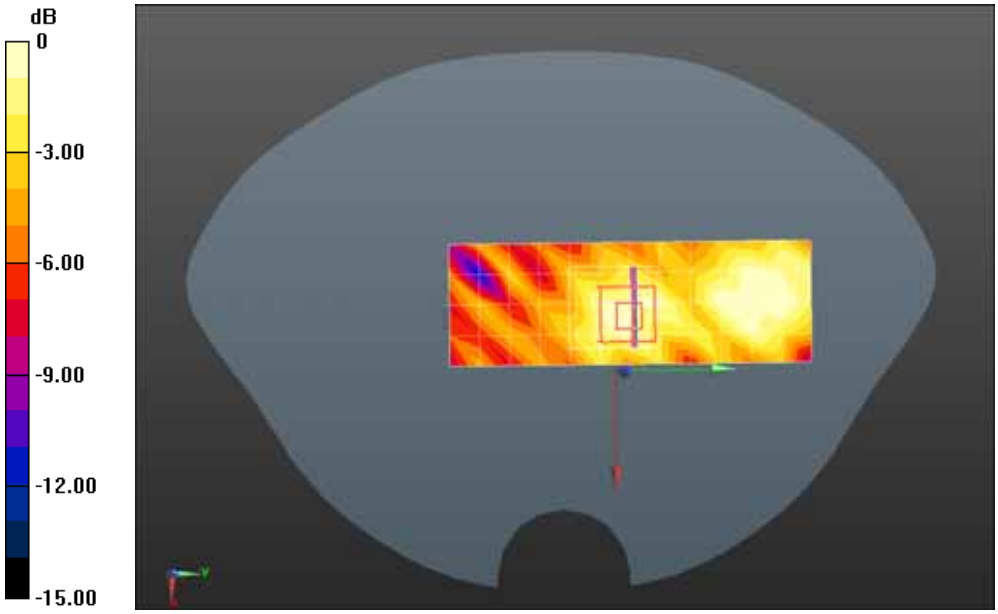
Maximum value of SAR (measured) = 0.0285 W/kg

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Body-Right side/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 2.014 V/m; Power Drift = -0.95 dB

Peak SAR (extrapolated) = 0.0490 W/kg

SAR(1 g) = 0.021 W/kg; SAR(10 g) = 0.010 W/kg Maximum value of SAR (measured) = 0.0250 W/kg



0 dB = 0.0250 W/kg = -16.02 dBW/kg

Date/Time: 01-16-2015

Test Laboratory: QuieTek Lab

LTE Band VII 20M QPSK 50RB#0 Low Body-Bottom

DUT: Mobile Phone; Type: LT40

Communication System: UID 0, LTE-FDD (SC-FDMA, 50 RB, 20 MHz, QPSK) (0); Communication System Band: Band VII; Duty Cycle: 1:1.0; Frequency: 2510 MHz; Medium parameters used: f = 2510 MHz; σ = 2.06 S/m; εr = 51.82; ρ = 1000 kg/m3 ; Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3710; ConvF(6.67, 6.67, 6.67); Calibrated: 04/03/2014;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 15/12/2014
- Phantom: SAM1; Type: SAM; Serial: TP1561
- Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Body-Bottom/Area Scan (5x9x1): Measurement grid: dx=12mm, dy=12mm

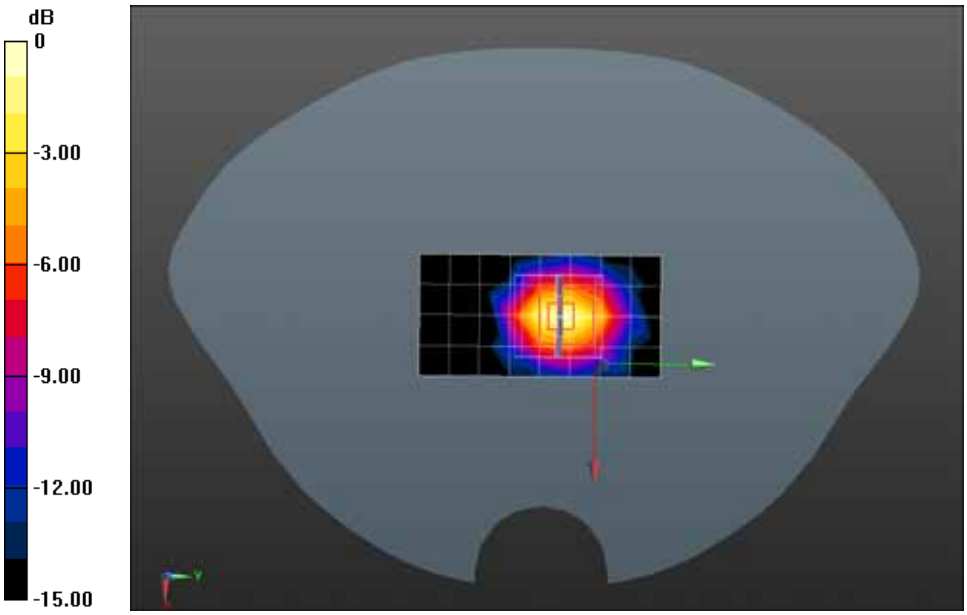
Maximum value of SAR (measured) = 0.364 W/kg

Configuration/LTE Band VII 20M QPSK 50RB#0 Low Body-Bottom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 12.686 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.743 W/kg

SAR(1 g) = 0.341 W/kg; SAR(10 g) = 0.148 W/kg

Maximum value of SAR (measured) = 0.390 W/kg

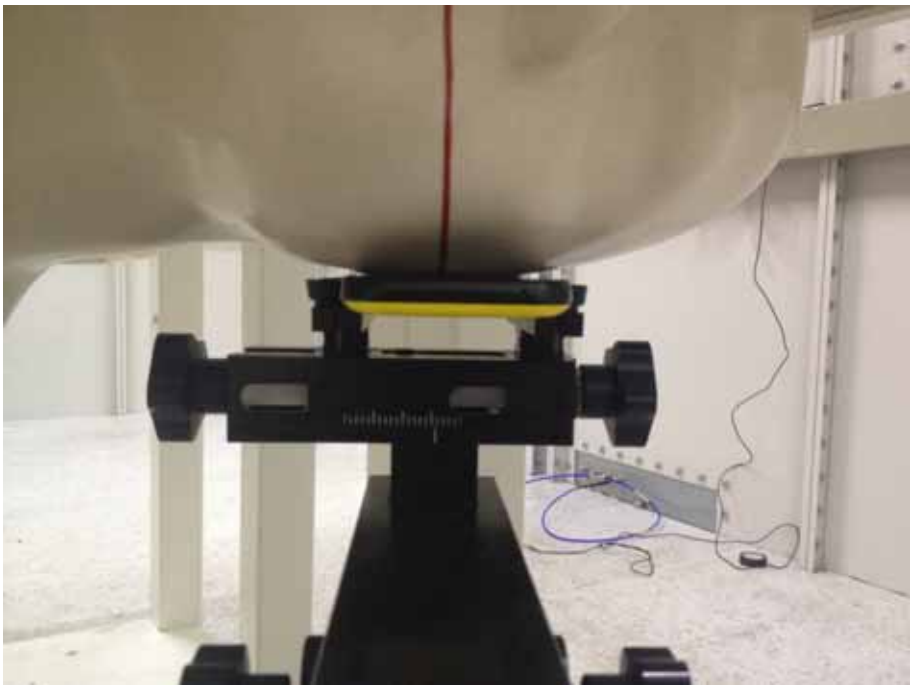


0 dB = 0.390 W/kg = -4.09 dBW/kg

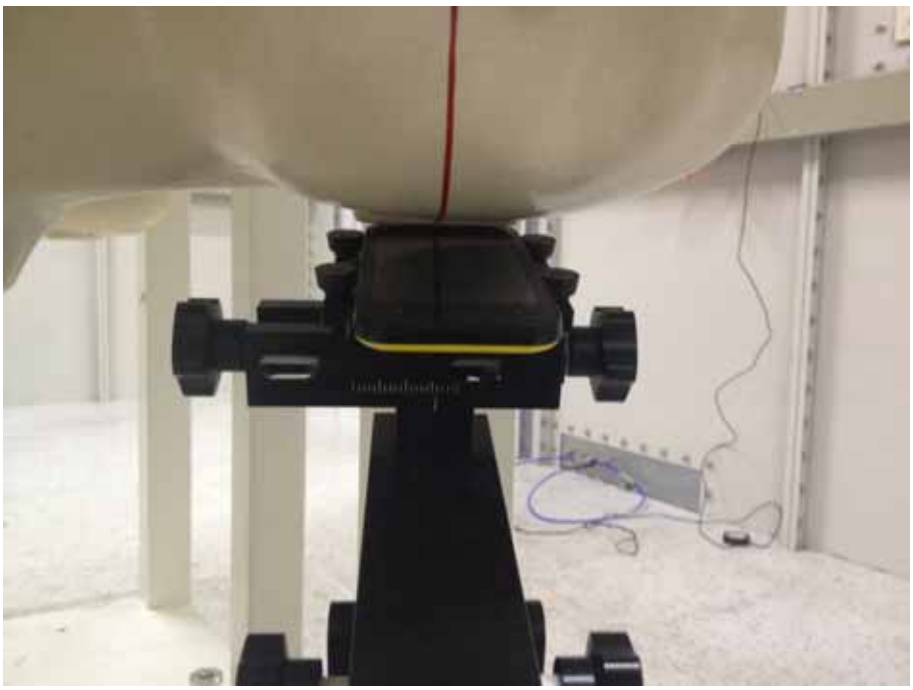
Appendix C. Test Setup Photographs & EUT Photographs

Test Setup Photographs

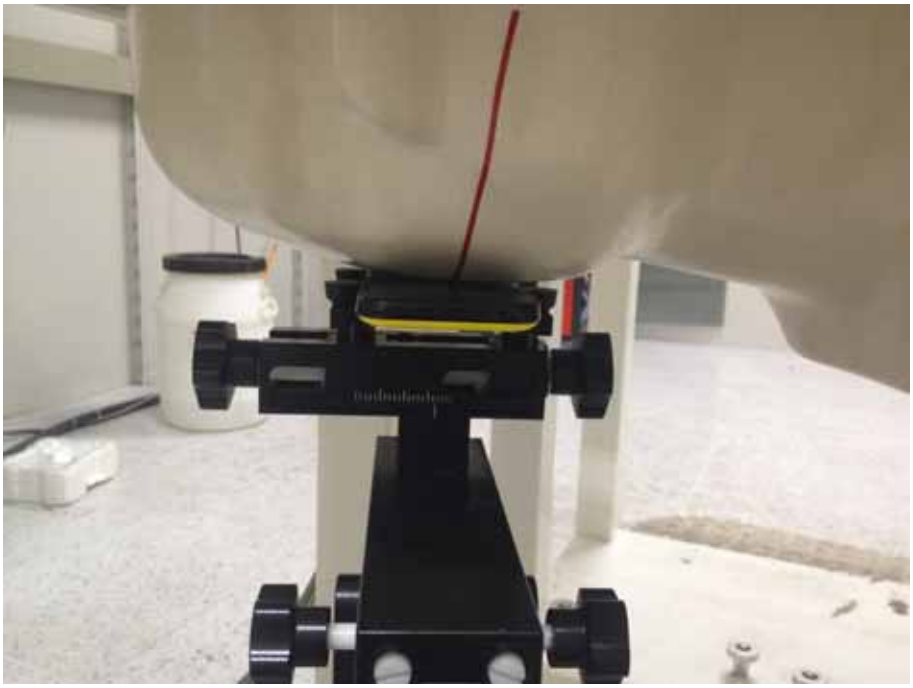
Left Head (EUT Cheek)



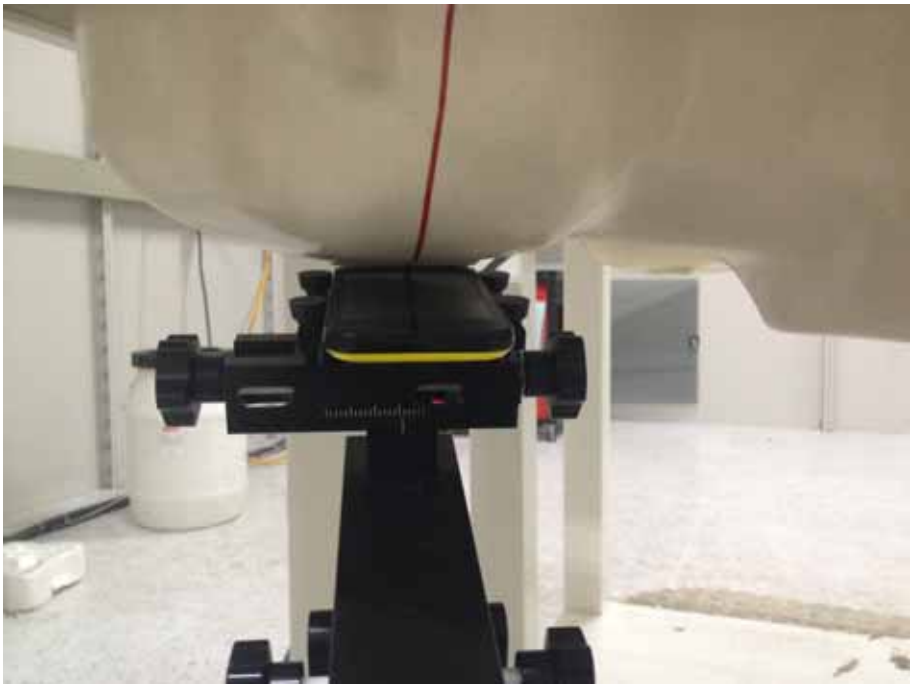
Left Head (EUT Tilted)



Right Head (EUT Cheek)



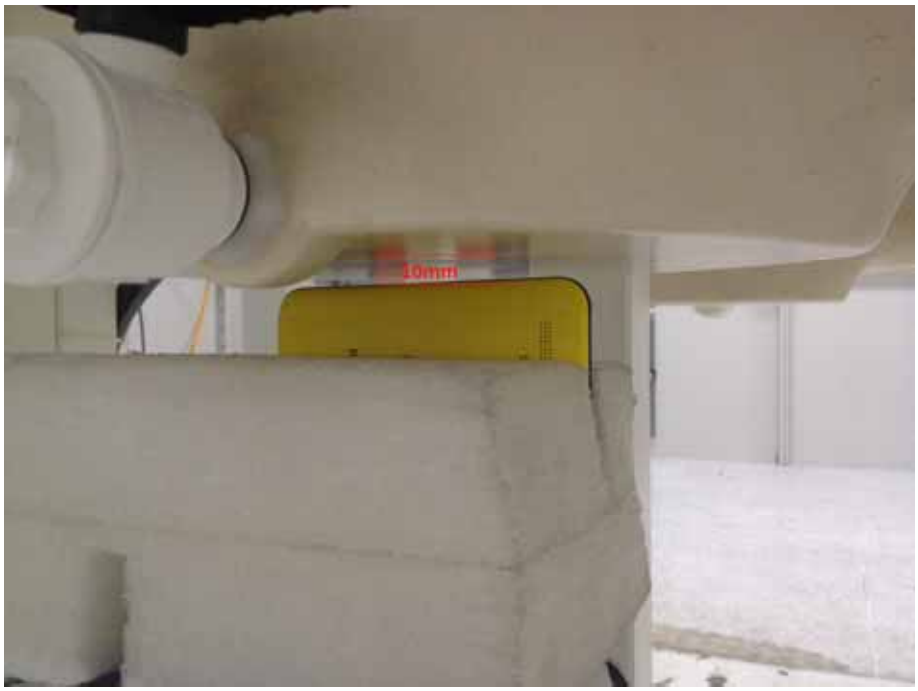
Right Head (EUT Tilted)



LTE Body Back at 10mm

LTE Body Front at 10mm

LTE Body Left side at 10mm

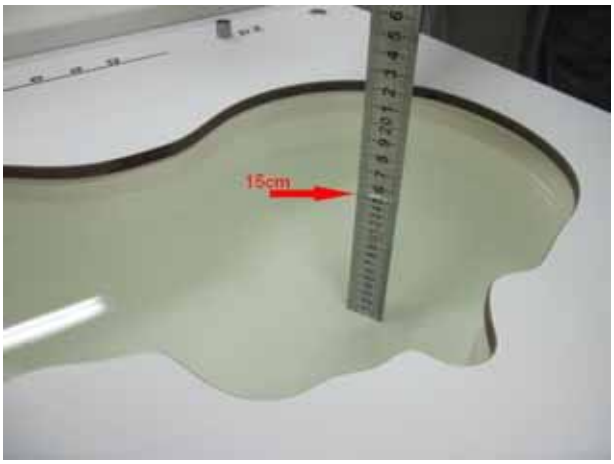


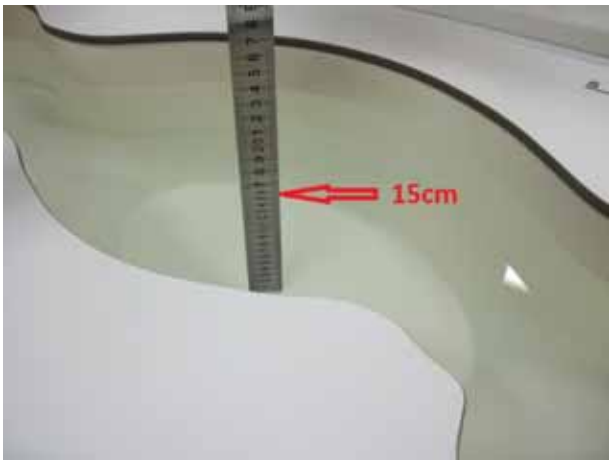
LTE Body Right side at 10mm

LTE Body Bottom at 10mm

Depth of the liquid in the phantom – Zoom in

Note: The position used in the measurements were according to IEEE 1528 - 2003





EUT Photographs

(1) EUT Photo

(2) EUT Photo

(3) EUT Photo

(4) EUT Photo

Appendix D. Probe 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
Swiss Calibration Service

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

Accreditation No.: **SCS 108**

Client **Quietek (Auden)**

Certificate No: **EX3-3710_Mar14**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3710
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	March 4, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: March 4, 2014

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

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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 108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3710

Manufactured: July 21, 2009
Calibrated: March 4, 2014

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3710

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.51	0.56	0.44	± 10.1 %
DCP (mV)[B]	100.3	97.6	101.3	

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	137.9	±3.5 %
		Y	0.0	0.0	1.0		136.7	
		Z	0.0	0.0	1.0		139.8	

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 NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3710

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)
450	43.5	0.87	10.42	10.42	10.42	0.17	2.22	± 13.3 %
750	41.9	0.89	9.76	9.76	9.76	0.62	0.69	± 12.0 %
835	41.5	0.90	9.56	9.56	9.56	0.57	0.69	± 12.0 %
900	41.5	0.97	9.42	9.42	9.42	0.53	0.72	± 12.0 %
1810	40.0	1.40	7.74	7.74	7.74	0.41	0.94	± 12.0 %
1900	40.0	1.40	7.72	7.72	7.72	0.49	0.85	± 12.0 %
2450	39.2	1.80	7.04	7.04	7.04	0.39	1.03	± 12.0 %
2600	39.0	1.96	6.87	6.87	6.87	0.60	0.80	± 12.0 %
3500	37.9	2.91	6.82	6.82	6.82	0.55	0.88	± 13.1 %
5200	36.0	4.66	4.91	4.91	4.91	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.63	4.63	4.63	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.43	4.43	4.43	0.40	1.80	± 13.1 %

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3710

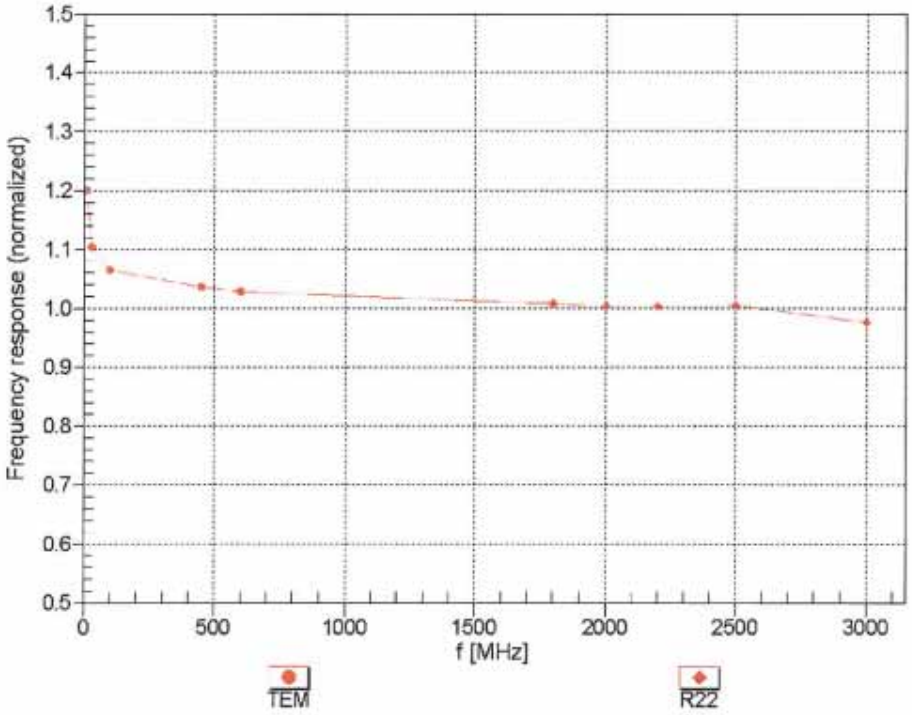
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
450	56.7	0.94	10.53	10.53	10.53	0.10	1.00	± 13.3 %
750	55.5	0.96	9.28	9.28	9.28	0.39	0.93	± 12.0 %
835	55.2	0.97	9.22	9.22	9.22	0.65	0.72	± 12.0 %
900	55.0	1.05	9.04	9.04	9.04	0.75	0.67	± 12.0 %
1810	53.3	1.52	7.36	7.36	7.36	0.80	0.62	± 12.0 %
1900	53.3	1.52	7.25	7.25	7.25	0.55	0.76	± 12.0 %
2450	52.7	1.95	6.88	6.88	6.88	0.80	0.58	± 12.0 %
2600	52.5	2.16	6.67	6.67	6.67	0.80	0.50	± 12.0 %
3500	51.3	3.31	6.29	6.29	6.29	0.44	1.02	± 13.1 %
5200	49.0	5.30	4.22	4.22	4.22	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.91	3.91	3.91	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.00	4.00	4.00	0.50	1.90	± 13.1 %

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

EX3DV4– SN:3710 March 4, 2014

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

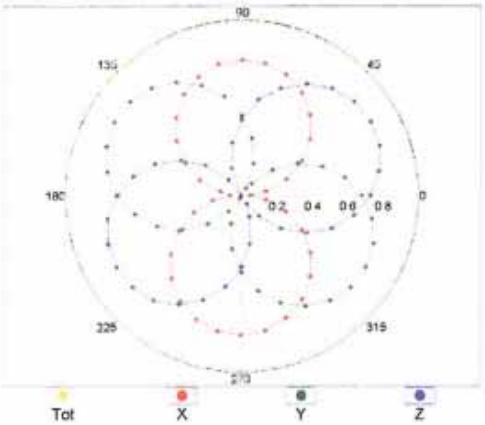


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

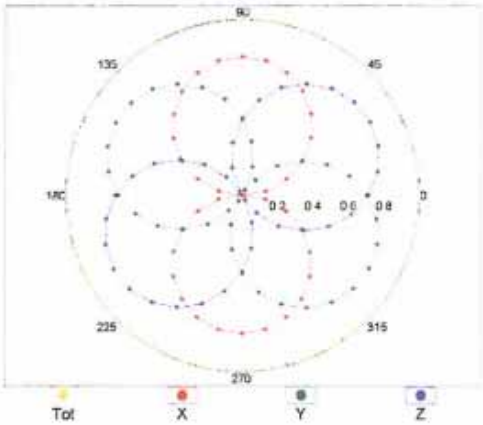
EX3DV4– SN:3710 March 4, 2014

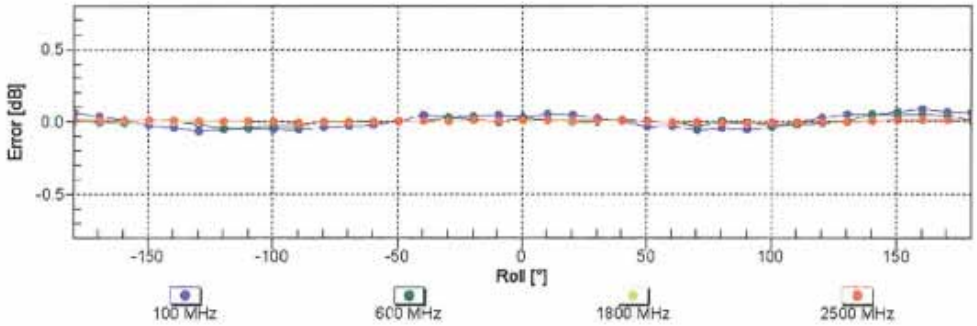
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

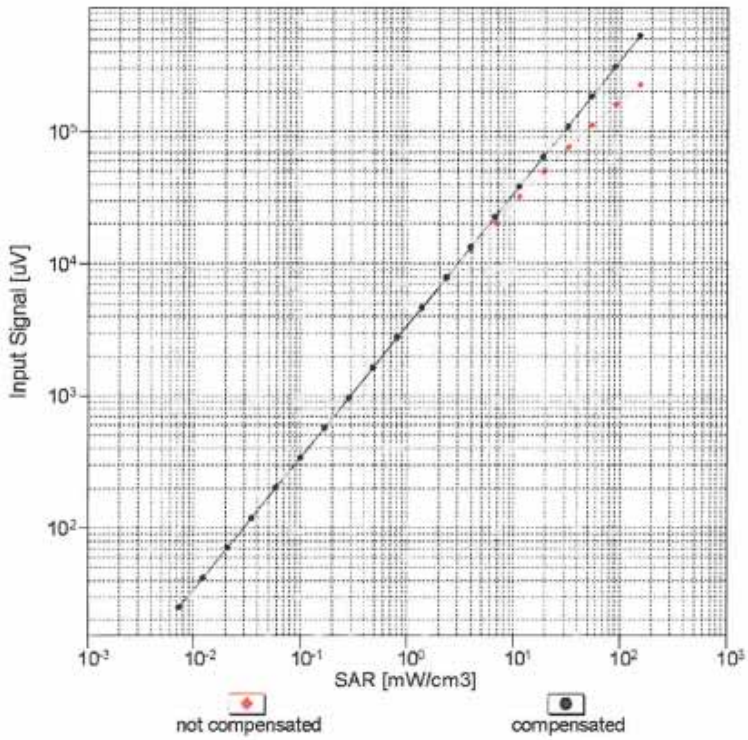


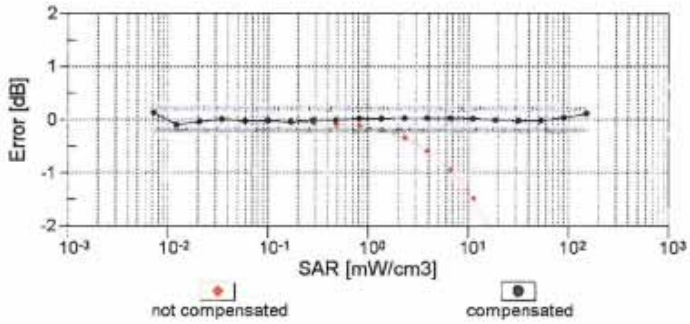


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4– SN:3710 March 4, 2014

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



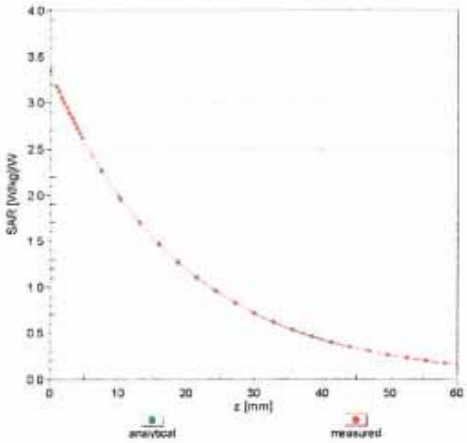


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

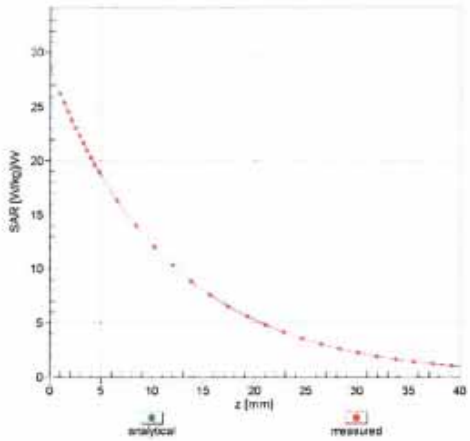
EX3DV4– SN:3710 March 4, 2014

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

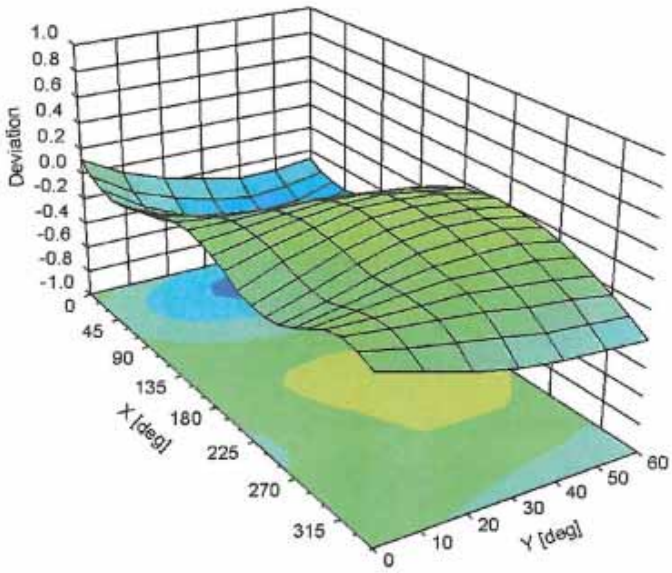


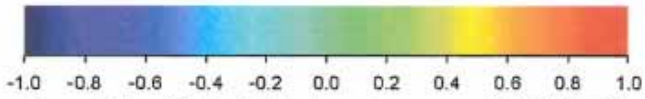
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

Certificate No: EX3-3710_Mar14 Page 10 of 11

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3710

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-19.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

Appendix E. Dipole Calibration Data

Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Client Quitek-CN (Auden)

Certificate No: D2600V2-1029_Feb14

CALIBRATION CERTIFICATE

Object	D2600V2 - SN: 1029
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 24, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

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

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

Issued: February 24, 2014

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.6 ± 6 %	2.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.8 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**57.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**26.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.2 ± 6 %	2.20 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	14.4 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**56.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.33 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**25.0 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω - 1.6 jΩ
Return Loss	- 33.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.9 Ω - 0.8 jΩ
Return Loss	- 29.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 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	March 03, 2009

DASY5 Validation Report for Head TSL

Date: 24.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1029

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.03 S/m; ε_r = 37.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

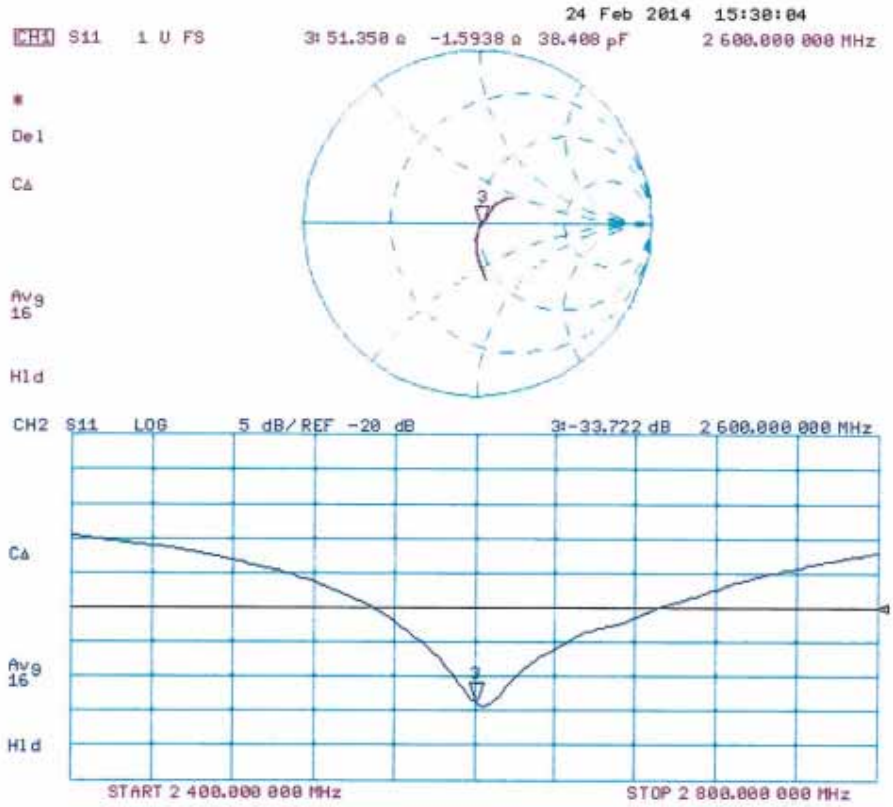
- Probe: ES3DV3 - SN3205; ConvF(4.46, 4.46, 4.46); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.1 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 14.8 W/kg; SAR(10 g) = 6.6 W/kg
Maximum value of SAR (measured) = 19.2 W/kg

0 dB = 19.2 W/kg = 12.83 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 24.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1029

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.2 S/m; ε_r = 50.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

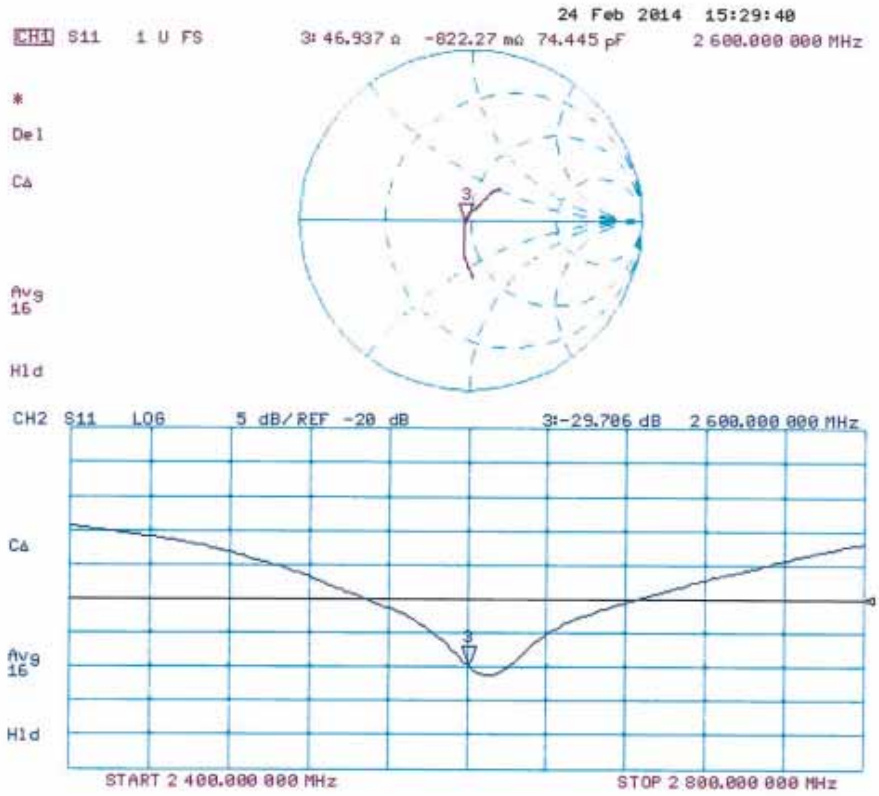
- Probe: ES3DV3 - SN3205; ConvF(4.24, 4.24, 4.24); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.131 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 14.4 W/kg; SAR(10 g) = 6.33 W/kg
Maximum value of SAR (measured) = 19.3 W/kg

0 dB = 19.3 W/kg = 12.86 dBW/kg

Impedance Measurement Plot for Body TSL



Appendix F. DAE Calibration Data

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Accreditation No.: SCS 108

Client **Auden**

Certificate No: DAE4-914_Dec14

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BK - SN: 914
Calibration procedure(s)	QA CAL-06.v28 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	December 15, 2014

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°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	07-Jan-14 (in house check)	In house check: Jan-15
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-14 (in house check)	In house check: Jan-15

	Name	Function	Signature
Calibrated by:	Eric Hainfeld	Technician	
Approved by:	Fin Bomholt	Deputy Technical Manager	i.V.

Issued: December 15, 2014

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Accreditation No.: **SCS 108**

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	405.057 ± 0.02% (k=2)	404.250 ± 0.02% (k=2)	403.832 ± 0.02% (k=2)
Low Range	3.99012 ± 1.50% (k=2)	3.98633 ± 1.50% (k=2)	3.98979 ± 1.50% (k=2)

Connector Angle

Connector Angle to be used in DASY system	64.0 ° ± 1 °

Appendix (Additional assessments outside the scope of SCS108)

1. DC Voltage Linearity

High Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	200032.55	-3.32	-0.00
Channel X	+ Input	20003.75	-0.54	-0.00
Channel X	- Input	-20004.74	1.15	-0.01
Channel Y	+ Input	200033.47	-2.28	-0.00
Channel Y	+ Input	20001.72	-2.40	-0.01
Channel Y	- Input	-20005.85	0.20	-0.00
Channel Z	+ Input	200035.63	-0.57	-0.00
Channel Z	+ Input	20001.09	-3.05	-0.02
Channel Z	- Input	-20007.62	-1.52	0.01

Low Range		Reading (µV)	Difference (µV)	Error (%)
Channel X	+ Input	2000.60	0.19	0.01
Channel X	+ Input	200.64	0.08	0.04
Channel X	- Input	-199.22	0.23	-0.12
Channel Y	+ Input	2000.43	0.16	0.01
Channel Y	+ Input	200.07	-0.25	-0.13
Channel Y	- Input	-200.01	-0.38	0.19
Channel Z	+ Input	2000.13	-0.16	-0.01
Channel Z	+ Input	199.27	-1.16	-0.58
Channel Z	- Input	-200.87	-1.33	0.67

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	-12.29	-13.91
	- 200	15.52	13.97
Channel Y	200	-5.10	-5.08
	- 200	4.28	4.17
Channel Z	200	4.95	5.07
	- 200	-7.69	-7.90

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	-	2.49	-4.55
Channel Y	200	7.79	-	2.18
Channel Z	200	10.06	5.72	-

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	16131	14753
Channel Y	16145	15519
Channel Z	16029	16244

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	0.69	-0.11	1.50	0.31
Channel Y	0.18	-1.37	2.08	0.61
Channel Z	0.71	-0.56	2.15	0.47

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