TEST REPORT

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1. Report No : DRRFCC1703-0033
2. Customer
   - Name :SenaTechnologies,Inc.
   - Address : 19, Heolleung-ro 569-gil, Gangnam-gu, Seoul, South Korea
3. Use of Report :FCC Original Grant
4. Product Name / Model Name : Bluetooth USB-Serial Adapter / IW09
   FCC ID : S7A-IW09
5. Test Method Used :CFR §2.1093
6. Date of Test : 2017-02-01 ~ 2017-02-02
7. Testing Environment : See appended test report
8. Test Result : Refer to the attached Test Result

Affirmation	Tested by Name : ChangWon Lee (Signature)	Technical Manager Name : HakMin Kim (Signature)

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2017 .03 .07 .

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If this report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRRFCC1703-0033	Mar. 07, 2017	Initial issue

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1.DESCRIPTION OF DEVICE

Environmental evaluation measurements of specific absorption rate (SAR) distributions in emulated human head tissues exposed to radio frequency (RF) radiation from wireless portable devices for compliance with the rules and regulations of the U.S. Federal Communications Commission (FCC).

General Information

<table>
<tr><td>EUT type</td><td colspan="3">Bluetooth USB-Serial Adapter</td></tr>
<tr><td>FCC ID</td><td colspan="3">S7A-IW09</td></tr>
<tr><td>Equipment model name</td><td colspan="3">IW09</td></tr>
<tr><td>Equipment add
model name</td><td colspan="3">N/A</td></tr>
<tr><td>Equipment serial no.</td><td colspan="3">Identical prototype</td></tr>
<tr><td>Mode(s) of Operation</td><td colspan="3">Bluetooth</td></tr>
<tr><td rowspan="2">TX Frequency Range</td><td>Band</td><td>Mode</td><td>Frequency</td></tr>
<tr><td>DSS</td><td>Bluetooth</td><td>2402 ~ 2480 MHz</td></tr>
<tr><td>RX Frequency Range</td><td>DSS</td><td>Bluetooth</td><td>2402 ~ 2480 MHz</td></tr>
<tr><td rowspan="3">Band</td><td rowspan="3">Mode</td><td rowspan="3">Ch</td><td>Reported SAR</td></tr>
<tr><td>1g SAR (W/kg)</td></tr>
<tr><td>Body</td></tr>
<tr><td>DSS</td><td>Bluetooth</td><td>78</td><td>0.637</td></tr>
<tr><td>FCC Equipment Class</td><td colspan="3">Part 15 Spread Spectrum Transmitter(DSS)</td></tr>
<tr><td>Date(s) of Tests</td><td colspan="3">2017-02-01 ~ 2017-02-02</td></tr>
<tr><td>Antenna Type</td><td colspan="3">Internal Type Antenna</td></tr>
<tr><td>Functions</td><td colspan="3">● Bluetooth (2.4GHz) is supported.</td></tr>
</table>

1.1 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 447498 D01v06 (General RF Exposure Guidance)
- FCC KDB Publication 447498 D02 (SAR Procedures for Dongle Xmtrv02r01)
- FCC KDB Publication 690783 D01 SAR Listings on Grants v01r03
- FCC KDB Publication 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB Publication 865664 D02 RF Exposure Reporting v01r02

1.2Device Overview

Band	Mode	Operating Modes	Tx Frequency
DSS	Bluetooth	Data	2402 ~ 2480 MHz

1.3 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

Band& Mode			Modulated Frame Average[dBm]		
			Ch. Low	Ch. Mid	Ch. High
DSS	Bluetooth 1Mbps	Maximum	11.0	12.0	12.0
		Nominal	10.0	11.0	11.0
		Minimum	9.0	10.0	10.0
	Bluetooth 2Mbps	Maximum	1.5	1.5	1.5
		Nominal	1.0	1.0	1.0
		Minimum	0.0	0.0	0.0
	Bluetooth 3Mbps	Maximum	1.5	1.5	1.5
		Nominal	1.0	1.0	1.0
		Minimum	0.0	0.0	0.0

1.4DUT Antenna Locations

Note(s):
1. Exact antenna dimensions and separation distances are shown in the “(IW09)_Manual.pdf” in the FCC Filing.

1.5 SAR Test Exclusions Applied

Bluetooth
Per FCC KDB 447498 D01v06, **the 1g SAR exclusion threshold for distances < 50 mm** is defined by the following equation:

$$\frac{Max\ Power\ of\ Channel\ (mW)}{Test\ Separation\ Dist\ (mm)} * \sqrt{Frequency(GHz)} \leq 3.0$$

Table 1.1 SAR exclusion threshold for distances < 50 mm

Band	Mode	Equation	Result	SAR exclusion threshold	Required SAR
DSS	Bluetooth	[(22/5)* √2.480]	7.1	3.0	O

Per KDBPublication 447498 D01v06, the maximum power of the channel was rounded to the nearest mWbefore calculation.

1.6 Power Reduction for SAR

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

1.7 Device Serial Numbers

Band & Mode	Serial Number
Bluetooth	FCC #1

2. INTROCUCTION

The FCC and Industry Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices.

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95*.1-2005 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring SAR due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86 NCRP, 1986, Bethesda, MD 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (dU)absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ) It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Fig. 2.1)

$$\boxed{SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{\rho dv}\right)}$$

Fig. 2.1 SAR Mathematical Equation

SAR is expressed in units of Watts per Kilogram (W/kg).

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

where:

σ = conductivity of the tissue-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/m^3)
E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

3. DESCRIPTION OF TEST EQUIPMENT

3.1 SAR MEASUREMENT SETUP

Measurements are performed using the DASY5 automated dosimetric assessment system. The DASY5 is made by Schmid& Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, desktop computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the muscle equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Fig. 3.1).

A cell controller system contains the power supply, robot controller each pendant (Joystick), and a remote control used to drive the robot motors. The PC consists of the Intel Core i7-3770 3.40 GHz desktop computer with Windows 7 system and SAR Measurement Software DASY5,A/D interface card, monitor, mouse, and keyboard. The StaubliRobotis connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical in to digital electric signal of the DAE and transfers data to the PC plug-in card.

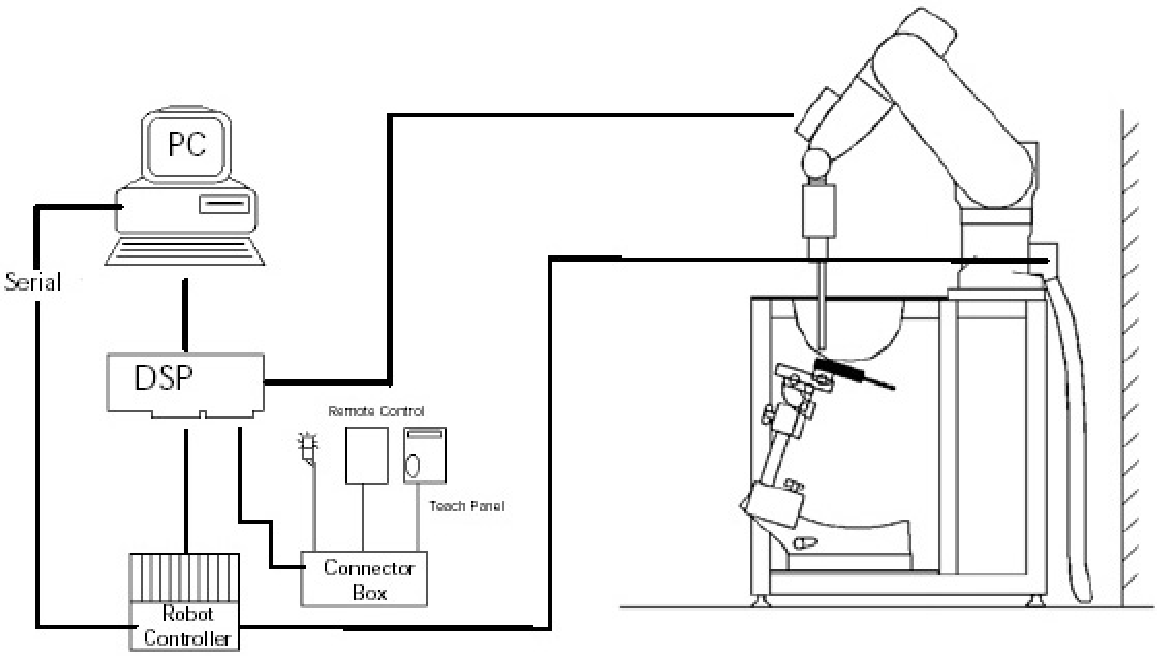

Figure 3.1 SAR Measurement System Setup

The DAE4 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 PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail.

3.2 ES3DV3Probe Specification

Calibration	In air from 10 MHz to 4 GHz In brain and muscle simulating tissue at Frequencies of 750 MHz, 835 MHz, 900 MHz, 1750 MHz, 1900 MHz, 2450 MHz, 2600 MHz
Frequency	10 MHz to 4 GHz
Linearity	± 0.2 dB(30 MHz to 4 GHz)
Dynamic	5 μW/g to > 100 mW/g
Range	Linearity : ±0.2dB
Dimensions	Overall length : 337 mm
Tip length	20 mm
Body diameter	12 mm
Tip diameter	3.9 mm
Distance from probe tip to sensor center	2.0 mm
Application	SAR Dosimetry Testing Compliance tests of mobile phones

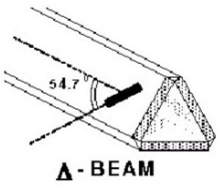

Figure 3.2 Triangular Probe Configurations

Figure 3.3 Probe Thick-Film Technique

DAE System

The SAR measurements were conducted with the dosimetric probe ES3DV3, designed in the classical triangular configuration(see Fig. 3.2) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multitier line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximumto the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY5 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped at reaching the maximum.

3.3 Probe Calibration Process

3.3.1 E-Probe Calibration

Dosimetric Assessment Procedure

Each probe is calibrated according to a do simetric assessment procedure with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), thediode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

Free Space Assessment

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

Temperature Assessment *

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

$$\text{SAR} = C\frac{\Delta T}{\Delta t}$$

where:

Δt = exposure time (30 seconds),

C = heat capacity of tissue (brain or muscle),

ΔT = temperature increase due to RF exposure.

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

where:

σ = simulated tissue conductivity,

ρ = Tissue density (1.25 g/cm^3 for brain tissue)

SAR is proportional toΔT / Δt , the initial rate of tissue heating, before thermal diffusion takes place. Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

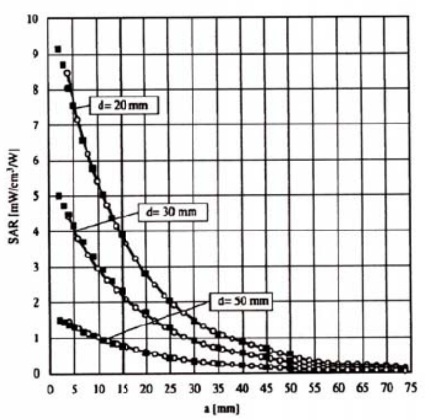

Figure 3.4E-Field and Temperature Measurements at 900MHz

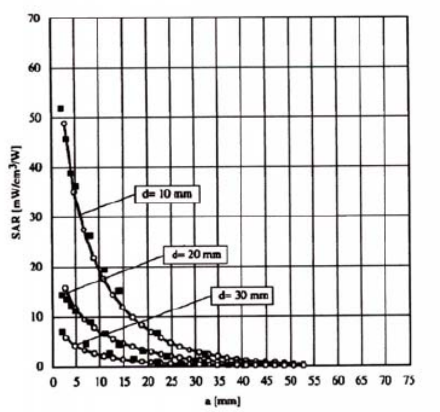

Figure 3.5 E-Field and Temperature Measurements at 1800MHz

3.4 Data Extrapolation

The DASY5 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given like below;

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

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

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

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

with V_i = compensated signal of channel i (i = x,y,z)
$Norm_i$ = sensor sensitivity of channel i (i = x,y,z) $\mu V/(V/m)^2$ for E-field probes
ConvF = sensitivity of enhancement in solution
E_i = electric field strength of channel i in V/m

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

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

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

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

The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770}$$

with P_{pwe} = equivalent power density of a plane wave in W/cm^2
E_{tot} = total electric field strength in V/m

3.5 ELI PHANTOM

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG do simetric probes and dipoles.

Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. (see Fig. 3.6)

Figure 3.6 ELI Phantom

ELI Phantom Specification:

Construction	ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure. ELI V6.0, released in August 2014, has the same shell geometry as ELI4 but offers increased long term stability. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot. The liquid depth is maintained at a minimum depth of 15cm to minimize reflections from the upper surface.
Shell Thickness	2.0 ± 0.2 mm
Filling Volume	Approx. 30 liters
Dimensions	Major axis: 600 mm Minor axis: 400 mm

3.6 Device Holder for Transmitters

In combination with the Twin SAM Phantom V4.0/V4.0c, V5.0 or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).

Note: A simulating human hand is not used due to the complex anatomical andgeometrical structure of the hand that may produce infinite number of configurations. To produce theworst-case condition (the hand absorbs antenna output power),thehand is omitted during the tests.

Figure 3.8 Mounting Device

3.7 Muscle Simulation Mixture Characterization

The muscle mixtures consist of a viscous gel using hydrox-ethylcellulose (HEC) gelling agent and saline solution (see Table 3.1). Preservation with a bactericide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The mixture characterizations used for the muscle tissue simulating liquids are according to the data by C. Gabriel and G. Harts grove.

Figure 3.8 SimulatedTissues

Table3.1 Composition of the Tissue Equivalent Matter

Ingredients (% by weight)	**Frequency (MHz)**
	2450
Tissue Type	**Body**
Water	73.40
Salt (NaCl)	0.060
Sugar	-
HEC	-
Bactericide	-
Triton X-100	-
DGBE	26.54
Diethylene glycol hexyl ether	-
Polysorbate (Tween) 80	-
Target for Dielectric Constant	52.7
Target for Conductivity (S/m)	1.95

Salt:	99 % Pure Sodium Chloride	Sugar:	98 % Pure Sucrose
Water:	De-ionized, 16M resistivity	HEC:	Hydroxyethyl Cellulose
DGBE:	99 % Di(ethylene glycol) butyl ether,[2-(2-butoxyethoxy) ethanol]		
Triton X-100(ultra pure):	Polyethylene glycol mono[4-(1,1,3,3-tetramethylbutyl)phenyl] ether		

3.8 SAR TEST EQUIPMENT

Table 3.2 Test Equipment Calibration

	Type	Manufacturer	Model	Cal.Date	Next.Cal.Date	S/N
☒	SEMITEC Engineering	SEMITEC	N/A	N/A	N/A	Shield Room
☒	Robot	SCHMID	TX60L	N/A	N/A	F14/5VR2A1/A/01
☒	Robot Controller	SCHMID	CS8C	N/A	N/A	F14/5VR2A1/C/01
☒	Joystick	SCHMID	N/A	N/A	N/A	D21142605A
☒	Intel Core i7-4770 3.40 GHz Windows 7 Professional	N/A	N/A	N/A	N/A	N/A
☒	Probe Alignment Unit LB	N/A	N/A	N/A	N/A	SE UKS 030 AA
☒	Mounting Device	SCHMID	SD000H01KA	N/A	N/A	N/A
☒	2mm Oval Phantom ELI6	SCHMID	QDOVA003AA	N/A	N/A	2008
☒	Data Acquisition Electronics	SCHMID	DAE4V1	2016-05-26	2017-05-26	1392
☒	Dosimetric E-Field Probe	SCHMID	ES3DV3	2016-08-30	2017-08-30	3327
☒	2450 MHz SAR Dipole	SCHMID	D2450V2	2016-09-23	2017-09-23	920
☒	Network Analyzer	Agilent	E5071C	2016-12-02	2017-12-02	MY46111534
☒	Signal Generator	Agilent	E4438C	2016-09-09	2017-09-09	US41461520
☒	Amplifier	EMPOWER	BBS3Q7ELU	2016-09-08	2017-09-08	1020
☒	Power Meter	HP	EPM-442A	2017-01-04	2018-01-04	GB37170267
☒	Power Meter	HP	EPM-442A	2016-06-23	2017-06-23	GB37170413
☒	Power Sensor	HP	8481A	2016-06-23	2017-06-23	3318A96332
☒	Power Sensor	HP	8481A	2017-01-04	2018-01-04	3318A96566
☒	Power Sensor	HP	8481A	2017-01-04	2018-01-04	2702A65976
☒	Dual Directional Coupler	HP	772D	2016-07-26	2017-07-26	2889A01064
☒	Low Pass Filter 3.0GHz	Micro LAB	LA-30N	2016-09-08	2017-09-08	N/A
☒	Attenuators (3 dB)	Agilent	8491B	2016-06-22	2017-06-22	MY39260700
☒	Attenuators (10 dB)	WEINSCHEL	23-10-34	2017-01-04	2018-01-04	BP4387
☒	Dielectric Probe kit	SCHMID	DAK-3.5	2016-11-17	2017-11-17	1092

NOTE: The E-field probe was calibrated by SPEAG, by temperature measurement procedure. Dipole Verification measurement is performed by DT&Cbefore each test. The muscle simulating material is calibrated byDT&C using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the muscle-equivalent material. Each equipment item was used solely within its respective calibration period.

4. TEST SYSTEM SPECIFICATIONS

Automated TEST SYSTEM SPECIFICATIONS:

Positioner

Robot	StäubliUnimation Corp. Robot Model: TX60L
Repeatability	0.02 mm
No. of axis	6

Data Acquisition Electronic (DAE) System

Cell Controller

Processor	Intel Core i7-4770
Clock Speed	3.40 GHz
Operating System	Windows 7 Professional
Data Card	DASY5 PC-Board

Data Converter

Features	Signal, multiplexer, A/D converter. & control logic
Software	DASY5
Connecting Lines	Optical downlink for data and status info Optical uplink for commands and clock

PC Interface Card

Function	24 bit (64 MHz) DSP for real time processing Link to DAE 4 16 bit A/D converter for surface detection system serial link to robot direct emergency stop output for robot

E-Field Probes

Model	ES3DV3 S/N: 3327
Construction	Triangular core fiber optic detection system
Frequency	10 MHz to 4 GHz
Linearity	± 0.2 dB (30 MHz to 4 GHz)

Phantom

Phantom	ELI Phantom
Shell Material	Composite
Thickness	2.0 ± 0.2 mm

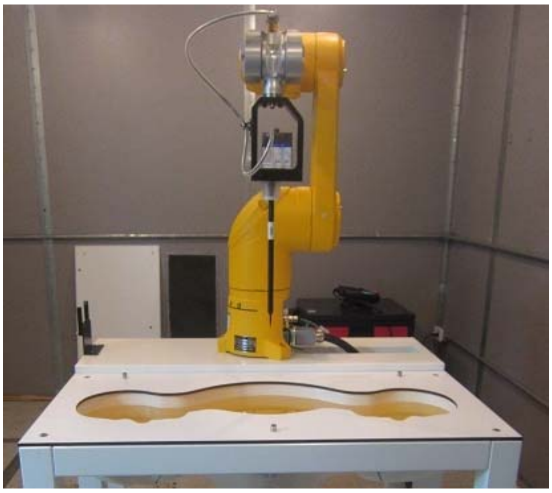

Figure 4.1 DASY5 Test System

5. SAR MEASUREMENT PROCEDURE

5.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to
FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 5-1) and IEEE1528-2013.

2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.

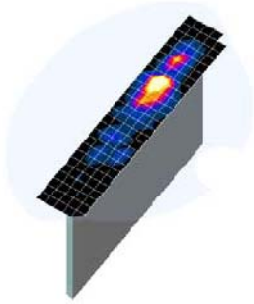

Figure 5.1
Sample SAR Area Scan

3. Based on the area scan data, the peak of the region with maximum SAR was determined by sp line interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 5-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 3-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).

   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional sp lines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.

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

4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

Frequency	Maximum Area Scan Resolution (mm) (Δx_{area}, Δy_{area})	Maximum Zoom Scan Resolution (mm) (Δx_{zoom}, Δy_{zoom})	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
			$\Delta z_{zoom}(n)$	$\Delta z_{zoom}(1)$*	$\Delta z_{zoom}(n>1)$*	
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≤ 4	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5*$\Delta z_{zoom}(n-1)$	≥ 22

Table 5.1 Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*
*Also compliant to IEEE 1528-2013 Table 6

6. RF EXPOSURE LIMITS

Uncontrolled Environment:

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals whohave no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

Controlled Environment:

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 8.1.SAR Human Exposure Specified in ANSI/IEEE C95.1-2005

	HUMAN EXPOSURE LIMITS	
	General Public Exposure (W/kg) or (mW/g)	Occupational Exposure (W/kg) or (mW/g)
SPATIAL PEAK SAR * (Brain)	1.60	8.00
SPATIAL AVERAGE SAR ** (Whole Body)	0.08	0.40
SPATIAL PEAK SAR *** (Hands / Feet / Ankle / Wrist)	4.00	20.0

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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

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

7. FCC MEASUREMENT PROCEDURES

7.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported SAR. The highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

7.2DONGLES WITH EXTERNAL, SWIVEL OR ROTATING ANTENNAS

For dongles with external antennas or antennas that may swivel or rotate, a KDB inquiry should be submitted to the FCC Laboratory to determine the applicable test configurations. The inquiry should identify if the antenna may transmit in its stowed position, and if a swivel or rotating USB connector is also used. Depending on the antenna configurations used in the individual dongle design and its operating configurations, different test separation distances may apply and must be determined on a case-by-case basis.

FCC response on 01/30/2017(Tracking Number 907592)

For the swivel antennas (Antennas a and b):

The following test guidance is based on the USB connector orientations provided in KDB 447498 DO2. Test the Horizontal Up and Horizontal Down positions of the dongle with the antenna connected in straight mode at a 5 mm distance to the SAR phantom. The testing of the antenna tip is not necessary. If the two measured SAR levels are similar, then additionally test the Horizontal Up position with the antenna connected at 90 degrees, perpendicular to the phantom (antenna pointing down and away from the phantom). A 5mm separation distance to the phantom would again apply. With these 3 test positions, SAR testing conditions for this dongle will be satisfied unless the following occurs:

If the SAR levels for the Horizontal Up and Horizontal Down positions of the dongle in antenna straight mode are not similar, then the dipole antenna is not symmetrical and the Vertical Front and Vertical Back positions in antenna straight mode also need to be tested at a 5 mm distance to the SAR phantom.

You should repeat this procedure for each antenna (a and b).

For the stub antenna (Antenna c):

The normal dongle procedures in KDB 447498 DO2 should be applied. Testing of the antenna tip is required.

8. RF CONDUCTED POWERS

8.1Bluetooth Conducted Powers

Channel	Frequency	Frame AVG Output Power (1Mbps)		Frame AVG Output Power (2Mbps)		Frame AVG Output Power (3Mbps)	
	(MHz)	(dBm)	(mW)	(dBm)	(mW)	(dBm)	(mW)
Low	2402	10.16	10.38	0.72	1.18	0.74	1.19
Mid	2441	11.19	13.15	0.66	1.16	0.71	1.18
High	2480	**11.84**	**15.28**	0.48	1.12	0.54	1.13

Table 8.1 Bluetooth Frame Average RF Power

- **Bluetooth Conducted Powers procedures**

1. Bluetooth (BDR, EDR)
 1) When EUT operating, The EUT is transmitting at maximum power level and duty cycle fixed.
 2) Measurement equipment and EUT were connected like Figure 8.2
 3) The maximum output powers of BDR(1 Mbps), EDR(2, 3 Mbps) and each frequency were set by a CSR Test PC.
 4) Power levels were measured by a Power Meter.

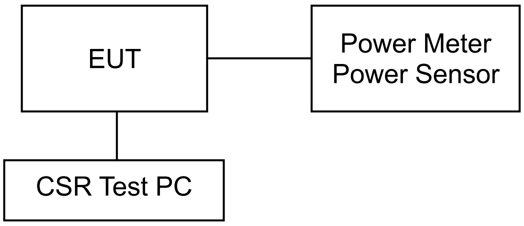

Figure 8.2Average Power Measurement Setup

The average conducted output powers of Bluetooth were measured using above test setup and a wideband RF power meter when the EUT is transmitting at its maximum power level and duty cycle fixed.

9. SYSTEM VERIFICATION

9.1 Tissue Verification

MEASURED TISSUE PARAMETERS										
Date(s)	Tissue Type	Ambient Temp.[°C]	Liquid Temp.[°C]	Measured Frequency [MHz]	Target Dielectric Constant, εr	Target Conductivity, σ (S/m)	Measured Dielectric Constant, εr	Measured Conductivity, σ (S/m)	Er Deviation [%]	σ Deviation [%]
Feb.01. 2017	2450 Body	21.4	21.6	2402	52.764	1.904	51.752	1.905	-1.92	0.05
				2441	52.712	1.941	51.669	1.953	-1.98	0.62
				2450	52.700	1.950	51.643	1.963	-2.01	0.67
				2480	52.662	1.993	51.556	1.997	-2.10	0.20
Feb.02. 2017	2450 Body	21.1	21.5	2402	52.764	1.904	51.938	1.875	-1.57	-1.52
				2441	52.712	1.941	51.704	1.928	-1.91	-0.67
				2450	52.700	1.950	51.626	1.937	-2.04	-0.67
				2480	52.662	1.993	51.355	1.964	-2.48	-1.46

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB 865664 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

Measurement Procedure for Tissue verification:

1) The network analyzer and probe system was configured and calibrated.
2) The probe was immersed in the sample which was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
3) The complex admittance with respect to the probe aperture was measured
4) The complex relative permittivity , for example from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{[\ln(b/a)]^2}\int_a^b\int_a^b\int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r'\varepsilon_0)^{1/2}\right]}{r} d\phi' d\rho' d\rho$$

where Y is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

9.2 Test System Verification

Prior to assessment, the system is verified to the± 10 % of the specifications at 2450 MHz by using the SAR Dipole kit(s). (Graphic Plots Attached)

SYSTEM DIPOLE VERIFICATION TARGET & MEASURED												
SAR System #	Freq. [MHz]	SAR Dipole kits	Date(s)	Tissue Type	Ambient Temp.[°C]	Liquid Temp.[°C]	Probe S/N	Input Power (mW)	1 W Target SAR_{1g} (W/kg)	Measured SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	Deviation [%]
B	2450	D2450V2, SN: 920	Feb.01. 2017	Body	21.4	21.6	3327	250	51.00	13.60	54.40	6.67
B	2450	D2450V2, SN: 920	Feb.02. 2017	Body	21.1	21.5	3327	250	51.00	13.10	52.40	2.75

Note1 : System Verification was measured with input 250 mWand normalized to 1W.
Note2 : To confirm the proper SAR liquid depth, the z-axis plots from the system verifications were included since the system verifications were performed using the same liquid, probe and DAE as the SAR tests in the same time period.
Note3: Full system validation status and results can be found in Attachment 3.

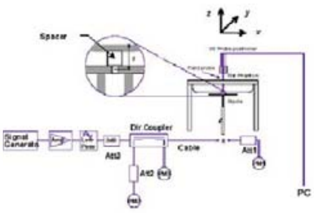

Figure 9.1 Dipole Verification Test Setup Diagram & Photo

10. SAR TEST RESULTS

10.1 Body SAR Results

Table 10.1DSS Body SAR– R-AN2400-1901RS Ant.

MEASUREMENT RESULTS												
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Data Rate [Mbps]	1g SAR (W/kg)	Scaling Factor	SAR (W/kg)	Plots #
MHz	Ch											
2480	78	Bluetooth	12.0	11.84	0.080	5 mm [Front #1]	FCC #1	1	0.220	1.038	0.228	
2480	78	Bluetooth	12.0	11.84	0.080	5 mm [Front #2]	FCC #1	1	0.211	1.038	0.219	
2480	78	Bluetooth	12.0	11.84	0.170	5 mm [Front #3]	FCC #1	1	0.211	1.038	0.219	
2480	78	Bluetooth	12.0	11.84	-0.030	5 mm [Front #4]	FCC #1	1	0.193	1.038	0.200	
2480	78	Bluetooth	12.0	11.84	0.130	5 mm [Front #5]	FCC #1	1	0.265	1.038	0.275	
2480	78	Bluetooth	12.0	11.84	0.080	5 mm [Front #7]	FCC #1	1	0.211	1.038	0.219	
2480	78	Bluetooth	12.0	11.84	0.030	5 mm [Front #8]	FCC #1	1	0.0047	1.038	0.005	
2480	78	Bluetooth	12.0	11.84	0.070	5 mm [Rear #1]	FCC #1	1	0.256	1.038	0.266	
2480	78	Bluetooth	12.0	11.84	0.120	5 mm [Rear #2]	FCC #1	1	0.266	1.038	0.276	
2480	78	Bluetooth	12.0	11.84	0.130	5 mm [Rear #3]	FCC #1	1	0.274	1.038	0.284	
2480	**78**	**Bluetooth**	**12.0**	**11.84**	**-0.170**	**5 mm [Rear #4]**	**FCC #1**	**1**	**0.276**	**1.038**	**0.286**	**A1**
2480	78	Bluetooth	12.0	11.84	0.130	5 mm [Rear #5]	FCC #1	1	0.211	1.038	0.219	
2480	78	Bluetooth	12.0	11.84	0.190	5 mm [Rear #6]	FCC #1	1	0.0072	1.038	0.007	
2480	78	Bluetooth	12.0	11.84	0.020	5 mm [Rear #7]	FCC #1	1	0.183	1.038	0.190	
2480	78	Bluetooth	12.0	11.84	0.030	5 mm [Right #1]	FCC #1	1	0.129	1.038	0.134	
2480	78	Bluetooth	12.0	11.84	-0.150	5 mm [Right #2]	FCC #1	1	0.140	1.038	0.145	
2480	78	Bluetooth	12.0	11.84	-0.050	5 mm [Right #3]	FCC #1	1	0.135	1.038	0.140	
2480	78	Bluetooth	12.0	11.84	-0.150	5 mm [Right #4]	FCC #1	1	0.123	1.038	0.128	
2480	78	Bluetooth	12.0	11.84	-0.180	5 mm [Right #6]	FCC #1	1	0.146	1.038	0.152	
2480	78	Bluetooth	12.0	11.84	0.050	5 mm [Right #7]	FCC #1	1	0.00495	1.038	0.005	
2480	78	Bluetooth	12.0	11.84	-0.050	5 mm [Right #8]	FCC #1	1	0.133	1.038	0.138	
2480	78	Bluetooth	12.0	11.84	0.050	5 mm [Left #1]	FCC #1	1	0.151	1.038	0.157	
2480	78	Bluetooth	12.0	11.84	0.080	5 mm [Left #2]	FCC #1	1	0.146	1.038	0.152	
2480	78	Bluetooth	12.0	11.84	0.050	5 mm [Left #3]	FCC #1	1	0.150	1.038	0.156	
2480	78	Bluetooth	12.0	11.84	0.100	5 mm [Left #4]	FCC #1	1	0.140	1.038	0.145	
2480	78	Bluetooth	12.0	11.84	0.070	5 mm [Left #5]	FCC #1	1	0.00429	1.038	0.004	
2480	78	Bluetooth	12.0	11.84	-0.170	5 mm [Left #6]	FCC #1	1	0.134	1.038	0.139	
2480	78	Bluetooth	12.0	11.84	0.070	5 mm [Left #8]	FCC #1	1	0.111	1.038	0.115	
ANSI / IEEE C95.1-2005– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								**Body 1.6 W/kg (mW/g)** averaged over 1 gram				

Table 10.2 DSS Body SAR– R-AN2400-5801RS Ant.

MEASUREMENT RESULTS												
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Data Rate [Mbps]	1g SAR (W/kg)	Scaling Factor	SAR (W/kg)	Plots #
MHz	Ch											
2480	78	Bluetooth	12.0	11.84	0.100	5 mm [Front #1]	FCC #1	1	0.535	1.038	0.555	
2480	78	Bluetooth	12.0	11.84	0.030	5 mm [Front #2]	FCC #1	1	0.394	1.038	0.409	
2480	78	Bluetooth	12.0	11.84	-0.170	5 mm [Front #3]	FCC #1	1	0.226	1.038	0.235	
2480	78	Bluetooth	12.0	11.84	0.040	5 mm [Front #4]	FCC #1	1	0.330	1.038	0.343	
2480	78	Bluetooth	12.0	11.84	0.020	5 mm [Front #5]	FCC #1	1	0.221	1.038	0.229	
2480	78	Bluetooth	12.0	11.84	-0.030	5 mm [Front #7]	FCC #1	1	0.377	1.038	0.391	
2480	78	Bluetooth	12.0	11.84	-0.050	5 mm [Front #8]	FCC #1	1	0.0821	1.038	0.085	
2480	78	Bluetooth	12.0	11.84	0.070	5 mm [Rear #1]	FCC #1	1	0.424	1.038	0.440	
2480	78	Bluetooth	12.0	11.84	0.010	5 mm [Rear #2]	FCC #1	1	0.384	1.038	0.399	
2480	**78**	**Bluetooth**	**12.0**	**11.84**	**-0.060**	**5 mm [Rear #3]**	**FCC #1**	**1**	**0.614**	**1.038**	**0.637**	**A2**
2480	78	Bluetooth	12.0	11.84	-0.160	5 mm [Rear #4]	FCC #1	1	0.402	1.038	0.417	
2480	78	Bluetooth	12.0	11.84	0.040	5 mm [Rear #5]	FCC #1	1	0.427	1.038	0.443	
2480	78	Bluetooth	12.0	11.84	-0.040	5 mm [Rear #6]	FCC #1	1	0.137	1.038	0.142	
2480	78	Bluetooth	12.0	11.84	-0.010	5 mm [Rear #7]	FCC #1	1	0.192	1.038	0.199	
2480	78	Bluetooth	12.0	11.84	0.130	5 mm [Right #1]	FCC #1	1	0.171	1.038	0.177	
2480	78	Bluetooth	12.0	11.84	0.080	5 mm [Right #2]	FCC #1	1	0.0985	1.038	0.102	
2480	78	Bluetooth	12.0	11.84	0.140	5 mm [Right #3]	FCC #1	1	0.157	1.038	0.163	
2480	78	Bluetooth	12.0	11.84	0.180	5 mm [Right #4]	FCC #1	1	0.183	1.038	0.190	
2480	78	Bluetooth	12.0	11.84	0.120	5 mm [Right #6]	FCC #1	1	0.177	1.038	0.184	
2480	78	Bluetooth	12.0	11.84	0.130	5 mm [Right #7]	FCC #1	1	0.0587	1.038	0.061	
2480	78	Bluetooth	12.0	11.84	0.020	5 mm [Right #8]	FCC #1	1	0.140	1.038	0.145	
2480	78	Bluetooth	12.0	11.84	0.100	5 mm [Left #1]	FCC #1	1	0.245	1.038	0.254	
2480	78	Bluetooth	12.0	11.84	0.020	5 mm [Left #2]	FCC #1	1	0.366	1.038	0.380	
2480	78	Bluetooth	12.0	11.84	0.060	5 mm [Left #3]	FCC #1	1	0.298	1.038	0.309	
2480	78	Bluetooth	12.0	11.84	0.150	5 mm [Left #4]	FCC #1	1	0.221	1.038	0.229	
2480	78	Bluetooth	12.0	11.84	0.030	5 mm [Left #5]	FCC #1	1	0.0655	1.038	0.068	
2480	78	Bluetooth	12.0	11.84	0.010	5 mm [Left #6]	FCC #1	1	0.224	1.038	0.233	
2480	78	Bluetooth	12.0	11.84	0.070	5 mm [Left #8]	FCC #1	1	0.151	1.038	0.157	
ANSI / IEEE C95.1-2005– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								**Body 1.6 W/kg (mW/g)** averaged over 1 gram				

Table 10.3 DSS Body SAR - AN2400-3306RS Ant.

MEASUREMENT RESULTS												
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Drift Power [dB]	Phantom Position	Device Serial Number	Data Rate [Mbps]	1g SAR (W/kg)	Scaling Factor	SAR (W/kg)	Plots #
MHz	Ch											
2480	78	Bluetooth	12.0	11.84	0.020	5 mm [Front]	FCC #1	1	0.340	1.038	0.353	
2480	**78**	**Bluetooth**	**12.0**	**11.84**	**0.190**	**5 mm [Rear]**	**FCC #1**	**1**	**0.346**	**1.038**	**0.359**	**A3**
2480	78	Bluetooth	12.0	11.84	0.040	5 mm [Right]	FCC #1	1	0.190	1.038	0.197	
2480	78	Bluetooth	12.0	11.84	0.190	5 mm [Left]	FCC #1	1	0.181	1.038	0.188	
2480	78	Bluetooth	12.0	11.84	-0.170	5 mm [Tip]	FCC #1	1	0.020	1.038	0.021	
ANSI / IEEE C95.1-2005– SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure								**Body 1.6 W/kg (mW/g)** averaged over 1 gram				

10.2SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified inIEEE 1528-2013, and FCC KDB Publication447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery wasused for all SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanicaland thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCCKDB Publication 447498 D01v06.

11. IEEE Std1528 –MEASUREMENT UNCERTAINTIES

2450 MHz Body

Error Description	Uncertainty value ±%	Probability Distribution	Divisor	(Ci) 1g	Standard (1g)	vi 2 or Veff
Measurement System						
Probe calibration	± 6.0	Normal	1	1	± 6.0 %	∞
Axial isotropy	± 4.7	Rectangular	√3	1	± 2.714 %	∞
Hemispherical isotropy	± 9.6	Rectangular	√3	1	± 5.543 %	∞
Boundary Effects	± 0.8	Rectangular	√3	1	± 0.462 %	∞
Probe Linearity	± 4.7	Rectangular	√3	1	± 2.714 %	∞
Probe Modulation response	± 2.4	Rectangular	√3	1	± 1.386 %	
Detection limits	± 0.25	Rectangular	√3	1	± 0.145 %	∞
Readout Electronics	± 1.0	Normal	1	1	± 1.0 %	∞
Response time	± 0.8	Rectangular	√3	1	± 0.462 %	∞
Integration time	± 2.6	Rectangular	√3	1	± 1.501 %	∞
RF Ambient Conditions	± 3.0	Rectangular	√3	1	± 1.732 %	∞
Probe Positioner	± 0.4	Rectangular	√3	1	± 0.231 %	∞
Probe Positioning	± 2.9	Rectangular	√3	1	± 1.674 %	∞
Algorithms for Max. SAR Eval.	± 1.0	Rectangular	√3	1	± 0.577 %	∞
Test Sample Related						
Device Positioning	± 2.9	Normal	1	1	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	± 2.887 %	∞
Physical Parameters						
Phantom Shell	± 4.0	Rectangular	√3	1	± 2.31 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	± 2.887 %	∞
Liquid conductivity (Meas.)	± 4.7	Normal	1	0.64	± 4.7 %	∞
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.6	± 2.887 %	∞
Liquid permittivity (Meas.)	±4.4	Normal	1	0.6	± 4.4 %	∞
Temp. unc. - Conductivity	± 1.8	Rectangular	√3	0.78	± 1.039 %	∞
Temp. unc. - Permittivity	± 1.6	Rectangular	√3	0.23	± 0.924 %	∞
CombinedStandard Uncertainty					**± 12.3 %**	330
Expanded Uncertainty (k=2)					**± 24.6 %**	

The above measurement uncertainties are according to IEEE Std1528 (2013)

12.CONCLUSION

Measurement Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC. These measurements are taken to simulate the RF effects exposureunderthe worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect toall parameters subject to the test. The test results and statements relate only to the item(s)tested.

Please note that the absorption and distribution of electromagnetic energy in the body are every complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties ofboth the body and the environment. Other variables that may play a substantial role impossible biological effect are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease).

Because innumerable factors may interact to determine the specific biological outcome ofan exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

13. REFERENCES

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[21] Industry Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (AllFrequency Bands) Issue 5, March 2015.

[22] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in theFrequency Range from 3 kHz – 300 GHz, 2009

[23] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225,D01-D07

[24] SAR Measurement procedures for IEEE 802.11a/b/g KDB Publication 248227 D01v02r02

[25] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474D03-D04

[26] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDBPublication 616217 D04

[27] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02

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[29] 615223 D01 802 16e WI-Max SAR Guidance v01, Nov. 13, 2009

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Attachment 1. – Probe Calibration Data

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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S Swiss Calibration Service

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

Accreditation No.: **SCS 0108**

Client **DT&C (Dymstec)**

Certificate No: **ES3-3327_Aug16**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3327
Calibration procedure(s)	QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	August 30, 2016

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 NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: S5277 (20x)	05-Apr-16 (No. 217-02293)	Apr-17
Reference Probe ES3DV2	SN: 3013	31-Dec-15 (No. ES3-3013_Dec15)	Dec-16
DAE4	SN: 660	23-Dec-15 (No. DAE4-660_Dec15)	Dec-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

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

Issued: August 31, 2016

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

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

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe ES3DV3

SN:3327

Manufactured: January 10, 2012
Calibrated: August 30, 2016

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.16	1.18	1.04	± 10.1 %
DCP (mV)[B]	101.7	100.7	101.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	198.7	±3.8 %
		Y	0.0	0.0	1.0		183.4	
		Z	0.0	0.0	1.0		191.7	

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

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	41.9	0.89	6.89	6.89	6.89	0.80	1.19	± 12.0 %
835	41.5	0.90	6.62	6.62	6.62	0.80	1.15	± 12.0 %
900	41.5	0.97	6.47	6.47	6.47	0.80	1.20	± 12.0 %
1750	40.1	1.37	5.55	5.55	5.55	0.58	1.36	± 12.0 %
1900	40.0	1.40	5.35	5.35	5.35	0.48	1.54	± 12.0 %
2450	39.2	1.80	4.68	4.68	4.68	0.80	1.22	± 12.0 %
2600	39.0	1.96	4.58	4.58	4.58	0.80	1.27	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

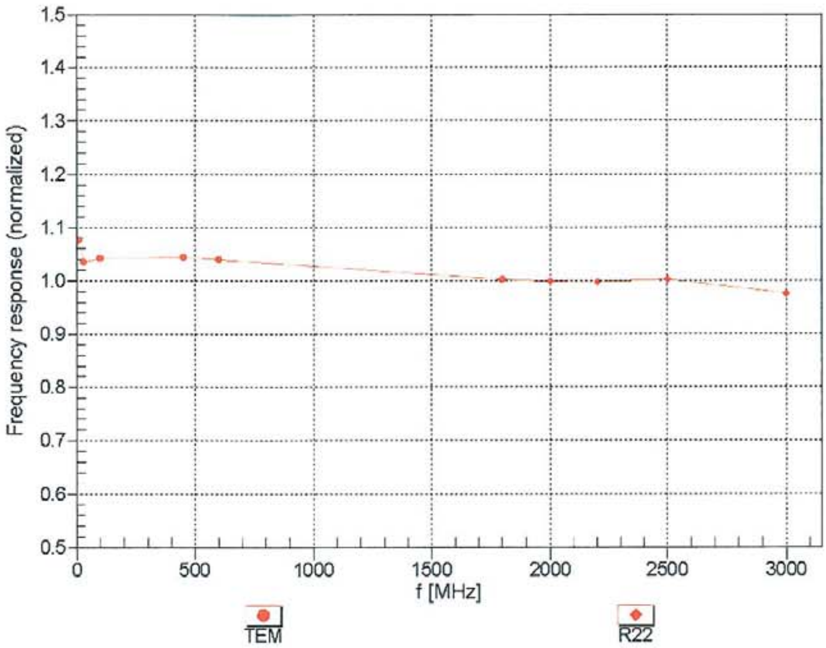
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unc (k=2)
750	55.5	0.96	6.43	6.43	6.43	0.51	1.42	± 12.0 %
835	55.2	0.97	6.48	6.48	6.48	0.41	1.63	± 12.0 %
900	55.0	1.05	6.45	6.45	6.45	0.80	1.15	± 12.0 %
1750	53.4	1.49	5.17	5.17	5.17	0.59	1.49	± 12.0 %
1900	53.3	1.52	4.95	4.95	4.95	0.67	1.40	± 12.0 %
2450	52.7	1.95	4.52	4.52	4.52	0.80	1.18	± 12.0 %
2600	52.5	2.16	4.32	4.32	4.32	0.79	1.15	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

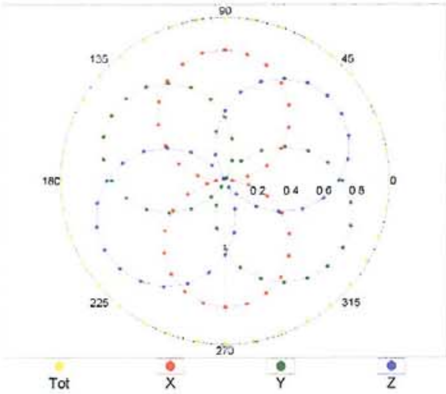
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



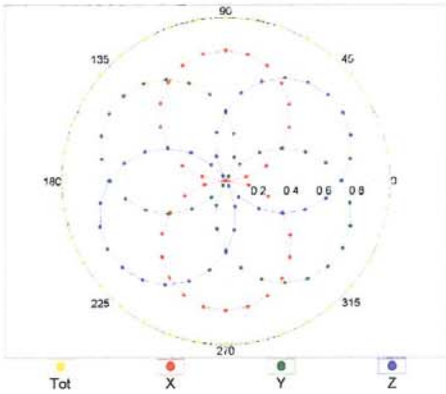
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

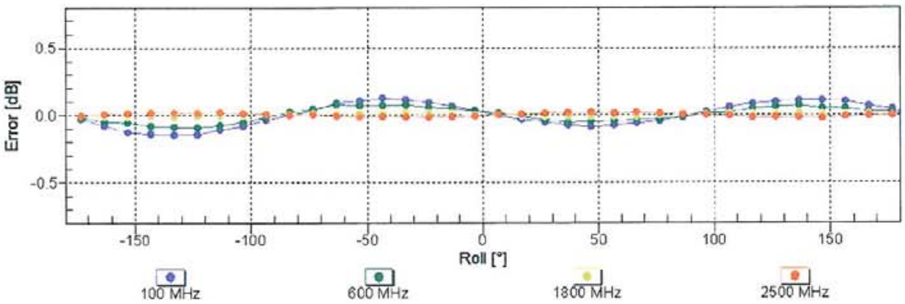
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

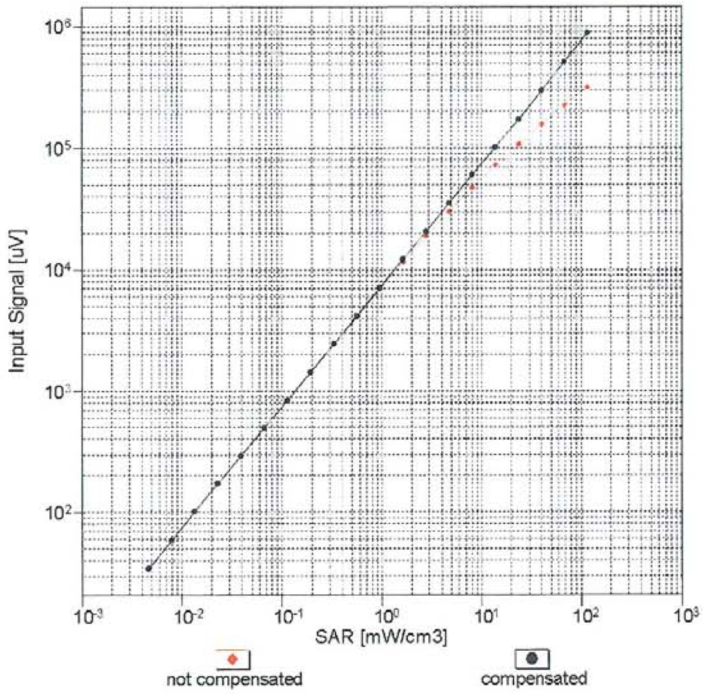


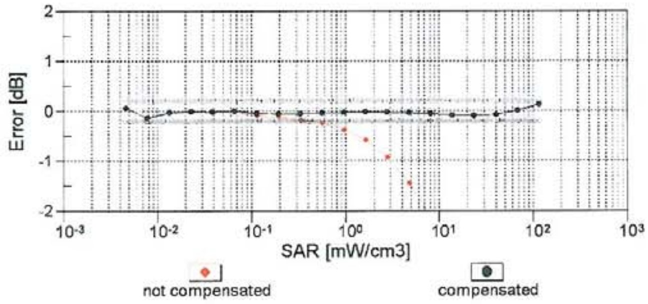


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

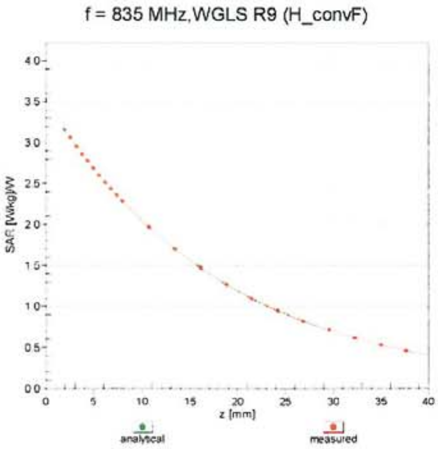
(TEM cell , f_{eval}= 1900 MHz)

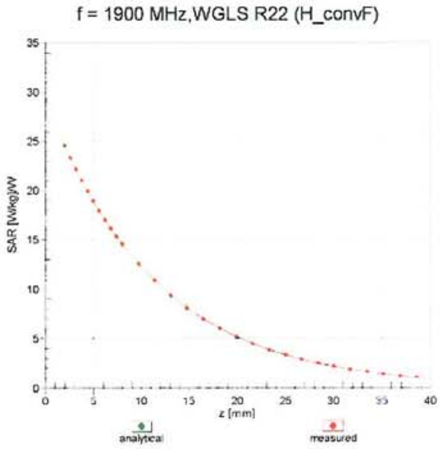




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

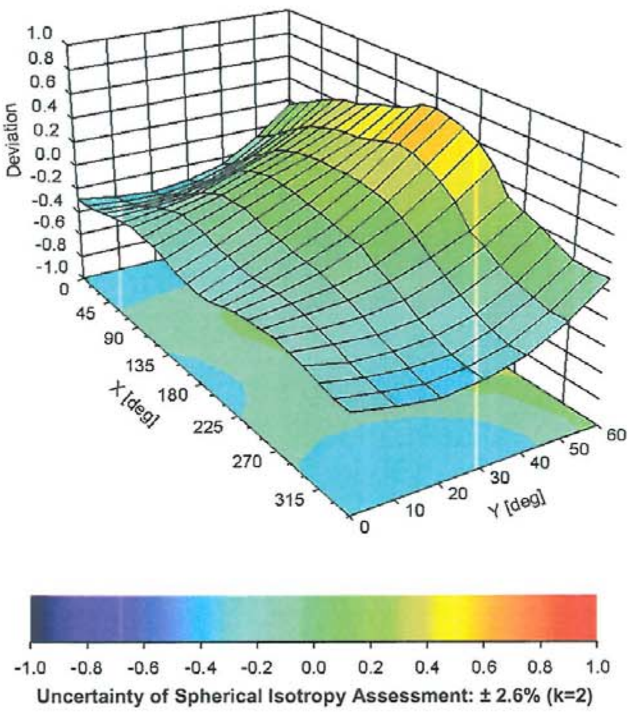
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3327

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	106.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

Attachment 2. – Dipole Calibration Data

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

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Accreditation No.: **SCS 0108**

Client **DT&C (Dymstec)**

Certificate No: **D2450V2-920_Sep16**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:920
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 23, 2016

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 NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	15-Jun-16 (No. EX3-7349_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

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

Issued: September 26, 2016

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	1.88 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.7 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.6 ± 6 %	2.04 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.1 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.9 Ω + 2.3 jΩ
Return Loss	- 24.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	52.3 Ω + 5.0 jΩ
Return Loss	- 25.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.154 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 19, 2012

DASY5 Validation Report for Head TSL

Date: 23.09.2016

Test Laboratory: SPEAG, Zurich, Switzerland

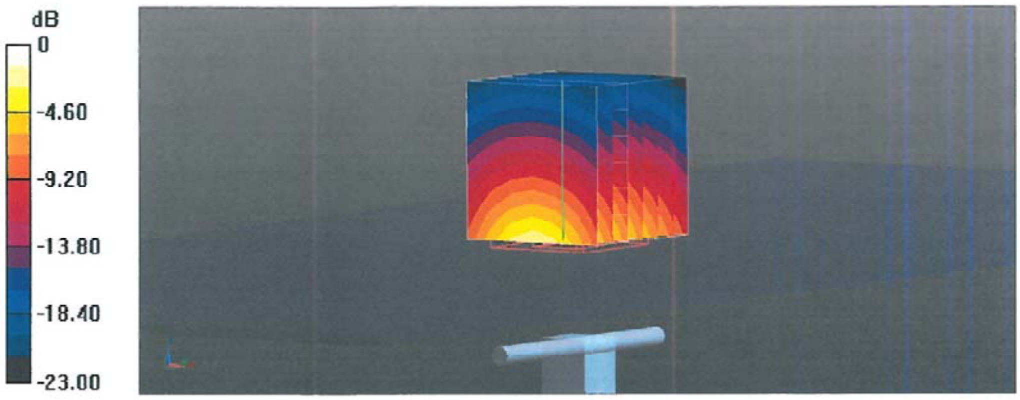
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:920

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.88 S/m; ε_r = 37.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

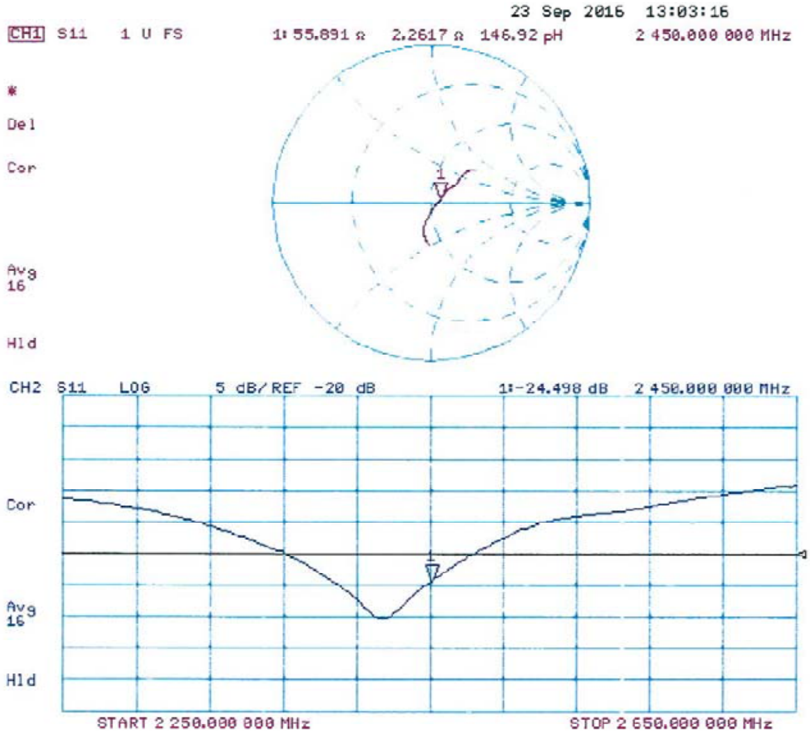
- Probe: EX3DV4 - SN7349; ConvF(7.72, 7.72, 7.72); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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 = 114.0 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.28 W/kg
Maximum value of SAR (measured) = 22.4 W/kg



0 dB = 22.4 W/kg = 13.50 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.09.2016

Test Laboratory: SPEAG, Zurich, Switzerland

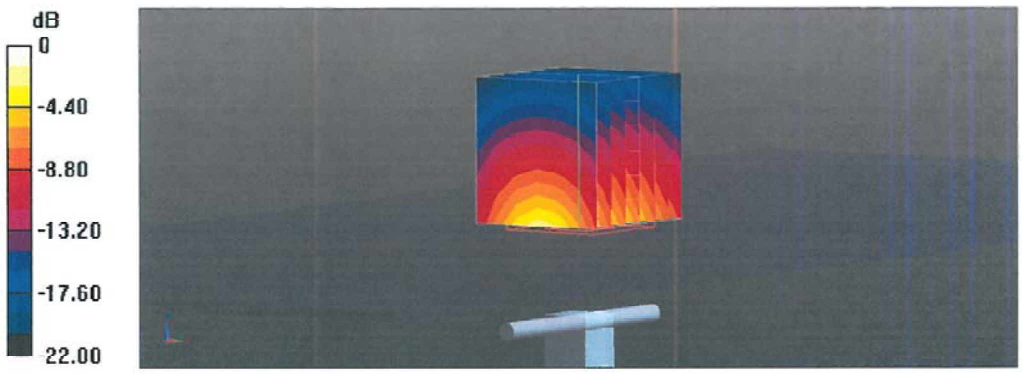
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:920

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.04 S/m; ε_r = 51.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

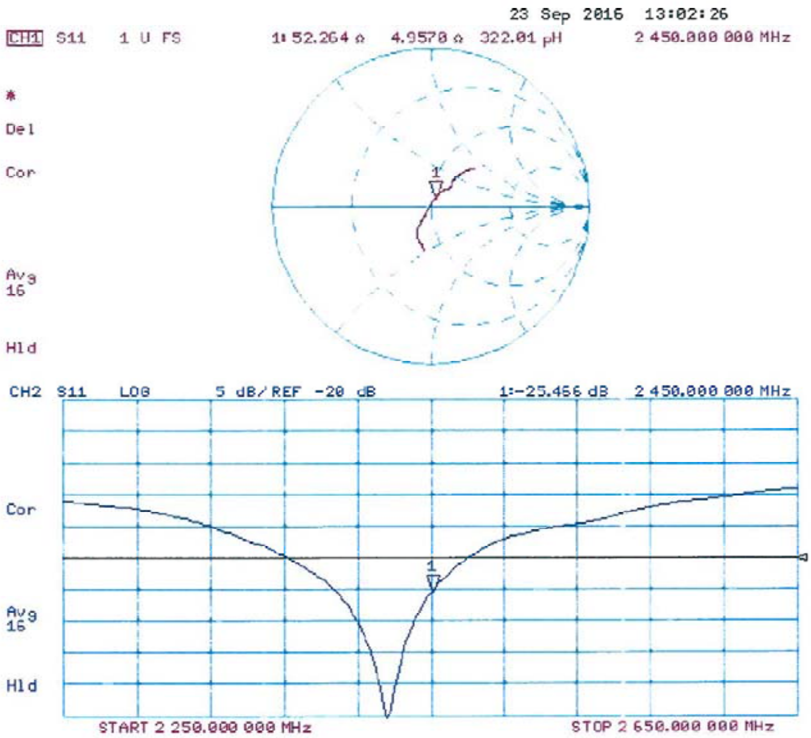
- Probe: EX3DV4 - SN7349; ConvF(7.79, 7.79, 7.79); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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 = 106.3 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 26.0 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.12 W/kg
Maximum value of SAR (measured) = 21.2 W/kg



0 dB = 21.2 W/kg = 13.26 dBW/kg

Impedance Measurement Plot for Body TSL



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Attachment 3. – SAR SYSTEM VALIDATION

SAR System Validation

Per FCC KDB 865664 D02v01r02, SAR system validation status should be documented to confirmmeasurement accuracy. The SAR systems (including SAR probes, system components and softwareversions) used for this device were validated against its performance specifications prior to the SARmeasurements. Reference dipoles were used with the required tissue- equivalent media for systemvalidation, according to the procedures outlined in FCC KDB 865664 D01v01r04 and IEEE 1528-2013.Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at afrequency within the valid frequency range of the probe calibration point, using the system that normallyoperates with the probe for routine SAR measurements and according to the required tissue-equivalentmedia.

A tabulated summary of the system validation status including the validation date(s), measurementfrequencies, SAR probes and tissue dielectric parameters has been included.

Table Attachment 3.1 SAR System Validation Summary

SAR System	Freq. [MHz]	Date	Probe SN	Probe Type	Probe CAL. Point		PERM.	COND.	CW Validation			MOD. Validation		
							(εr)	(σ)	Sensi-tivity	Probe Linearity	Probe Isortopy	MOD. Type	Duty Factor	PAR
B	2450	2016-09-08	3327	ES3DV3	2450	Body	51.883	1.914	PASS	PASS	PASS	OFDM	N/A	PASS

NOTE: While the probes have been calibrated for both a CW and modulated signals, all measurementswere performed using communication systems calibrated for CW signals only. Modulations in the tableabove represent test configurations for which the measurement system has been validated per FCC KDBPublication 865664 D01v01r04 for scenarios when CW probe calibrations are used with other signal types.SAR systems were validated for modulated signals with a periodic duty cycle, such as GMSK, or with ahigh peak to average ratio (>5 dB), such as OFDM according to KDB 865664.