RF Exposure Lab

802 N. Twin Oaks Valley Road, Suite 105 • San Marcos, CA 92069 • U.S.A.
TEL (760) 471-2100 • FAX (760) 471-2121
http://www.rfexposurelab.com

CERTIFICATE OF COMPLIANCE
SAR EVALUATION

Kenwood USA Corporation		Dates of Test:	January 7-8, 2013
3970 Johns Creek Court, Suite 100		Test Report Number:	SAR.20130102
Suwanee, GA 30024			Revision B

FCC ID:	ALH458200
Model(s):	NX-420-K3, NX-420-K
Test Sample:	Engineering Unit Same as Production
Serial Number:	0438
Equipment Type:	Push-To-Talk Handheld Radio for Occupational Use
Classification:	Portable Transmitter Next to Face and Body
TX Frequency Range:	806 – 824 MHz; 851 – 869 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	815 MHz – 34.77 dB, 860 MHz – 34.76 dB Conducted
Signal Modulation:	FM
Accessories:	Body Worn – Model KBH-12, KBH-13DS; Audio – Models KMC-48GPS, KMC-45, KMC-21, KHS-7, KHS-7A, KHS-8BE, KHS-8BL, KHS-9BE, KHS-9 BL, KHS-10BH, KHS-10OH, KEP-2, KHS-22, KHS-23, KHS-25, KHS-26, KHS-27
Antenna Type:	Model(s) KRA-24M, KRA-32, KRA-36, KRA-38
Battery:	Model(s) KNB-55L, KNB-57L, KNB-56N, KBP-5, KNB-40LCV
Application Type:	Certification
FCC Rule Parts:	Part 2, 90
IC Radio Standards:	RSS-119, RSS-134
KDB Test Methodology:	KDB 447498 D01 v05, KDB 643646 D01 v01r01
Test KDB Issued:	KDB 149273
Maximum SAR Value:	Face – 1.16 W/kg (Reported); Body – 2.57 W/kg (Reported)
Separation Distance:	25 mm for Face; 0 mm for Body

This wireless mobile and/or portable device has been shown to be compliant for localized specific absorption rate (SAR) for uncontrolled environment/general exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in IEEE 1528-2003, and OET Bulletin 65 Supp. C (See test report).

I attest to the accuracy of the data. All measurements were performed by myself or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

RF Exposure Lab, LLC certifies that no party to this application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

Jay M. Moulton
Vice President

ACCREDITED
Certificate # 2387.01

Table of Contents

1. Introduction

This measurement report shows compliance of the Kenwood USA Corporation Model(s) NX-420-K and NX-420-K3 FCC ID: ALH458200 with FCC Part 2, 1093, ET Docket 93-62 Rules for mobile and portable devices. The FCC have adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on August 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC regulated portable devices. [1], [6]

The test results recorded herein are based on a single type test of Kenwood USA Corporation Model(s) NX-420-K and NX-420-K3 and therefore apply only to the tested sample.

The test procedures, as described in ANSI C95.1 – 1999 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [2], ANSI C95.3 – 2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields [3], FCC OET Bulletin 65 Supp. C – 2001 [4], IEEE Std.1528 – 2003 Recommended Practice [5], and Industry Canada Safety Code 6 Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3kHz to 300 GHz were employed.

The following table indicates all the wireless technologies operating in the Model(s) NX-420-K and NX-420-K3 wireless device. The table also shows the tolerance for the power level for each mode if applicable.

Band	Technology	Class	Nominal Power dBm	Setpoint Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
806 – 824 MHz	FM	N/A	N/A	N/A	N/A	N/A	34.77
851 – 869 MHz	FM	N/A	N/A	N/A	N/A	N/A	34.77

SAR Definition [5]

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (*dW*) absorbed by (dissipated in) an incremental mass (*dm*) contained in a volume element (*dV*) of a given density (ρ).

$$SAR = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho dV}\right)$$

SAR is expressed in units of watts per kilogram (W/kg). *SAR* can be related to the electric field at a point by

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

where:

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m^3)

E = rms electric field strength (V/m)

2. SAR Measurement Setup

Robotic System

These measurements are performed using the DASY52 automated dosimetric assessment system. The DASY52 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, Intel Core2 computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain 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. 2.1).

System Hardware

A cell controller system contains the power supply, robot controller teach pendant (Joystick), and a remote control used to drive the robot motors. The PC consists of the HP Intel Core2 computer with Windows XP system and SAR Measurement Software DASY52, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is 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 into digital electric signal of the DAE and transfers data to the PC plug-in card.

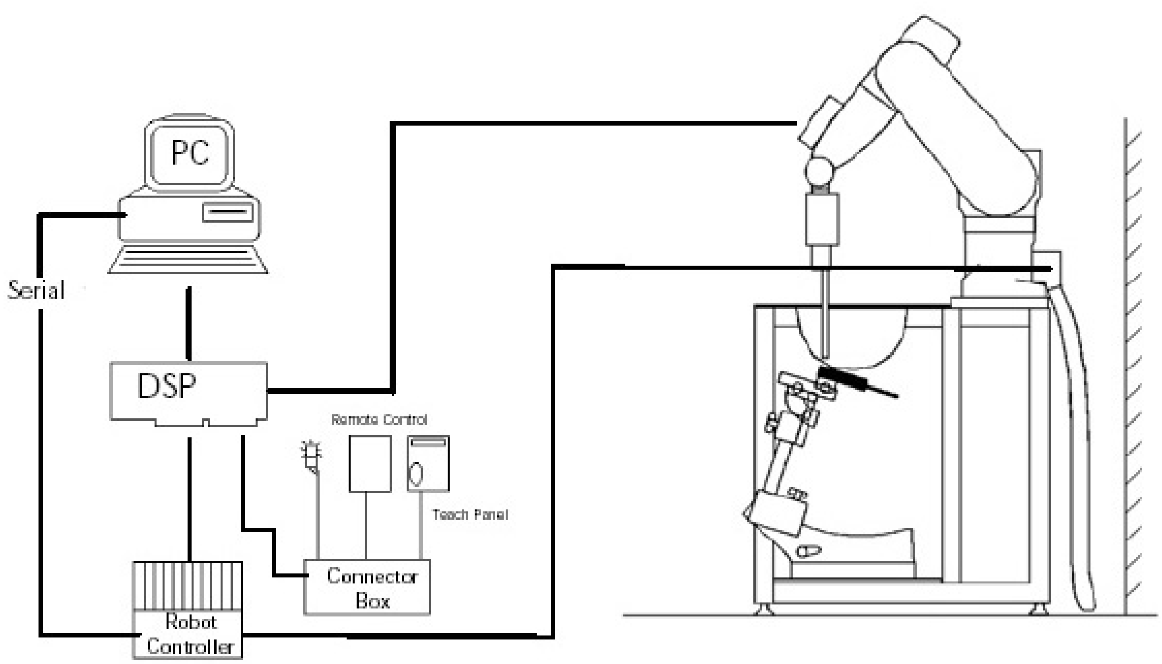


Figure 2.1 SAR Measurement System Setup

System Electronics

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 in.

Probe Measurement System

The SAR measurements were conducted with the dosimetric probe EX3DV4, designed in the classical triangular configuration (see Fig. 2.2) 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 multi fiber line ending at the front of the probe tip. (see Fig. 2.3) It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY52 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.

DAE System

Probe Specifications

Calibration: In air from 10 MHz to 6.0 GHz
In brain and muscle simulating tissue at Frequencies of 450 MHz, 835 MHz, 1750 MHz, 1900 MHz, 2450 MHz, 2600 MHz, 3500 MHz, 5200 MHz, 5300 MHz, 5600 MHz, 5800 MHz

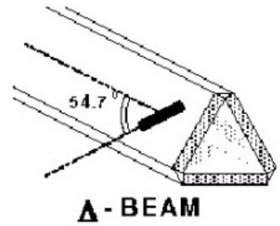


Figure 2.2 Triangular Probe Configurations

Frequency: 10 MHz to 6 GHz

Linearity: ±0.2dB (30 MHz to 6 GHz)

Dynamic: 10 mW/kg to 100 W/kg

Range: Linearity: ±0.2dB

Dimensions: Overall length: 330 mm

Tip length: 20 mm

Body diameter: 12 mm

Tip diameter: 2.5 mm

Distance from probe tip to sensor center: 1 mm

Figure 2.3 Probe Thick-Film Technique

Application: SAR Dosimetry Testing
Compliance tests of wireless device

Probe Calibration Process

Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure described in with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in and found to be better than +/-0.25dB. The sensitivity parameters (Norm X, Norm Y, Norm Z), the diode compression parameter (DCP) and the conversion factor (Conv F) 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 until the three channels show the maximum reading. The power density readings equates to 1 mW/cm^2.

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 thermistor based temperature probe is used in conjunction with the E-field probe

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

where:

Δt = exposure time (30 seconds),

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

ΔT = temperature increase due to RF exposure.

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

where:

σ = simulated tissue conductivity,

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

SAR is proportional to $\Delta T / \Delta t$, 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;

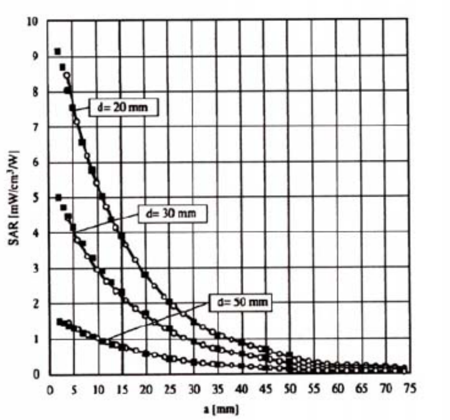


Figure 2.4 E-Field and Temperature Measurements at 900MHz

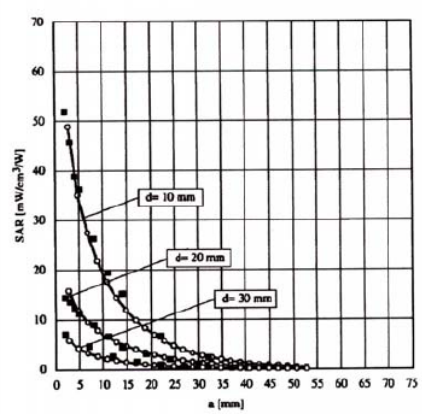


Figure 2.5 E-Field and Temperature Measurements at 1800MHz

Data Extrapolation

The DASY52 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

SAM PHANTOM

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. 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. 2.6)

Phantom Specification

Phantom: SAM Twin Phantom (V4.0)
Shell Material: Vivac Composite
Thickness: 2.0 ± 0.2 mm

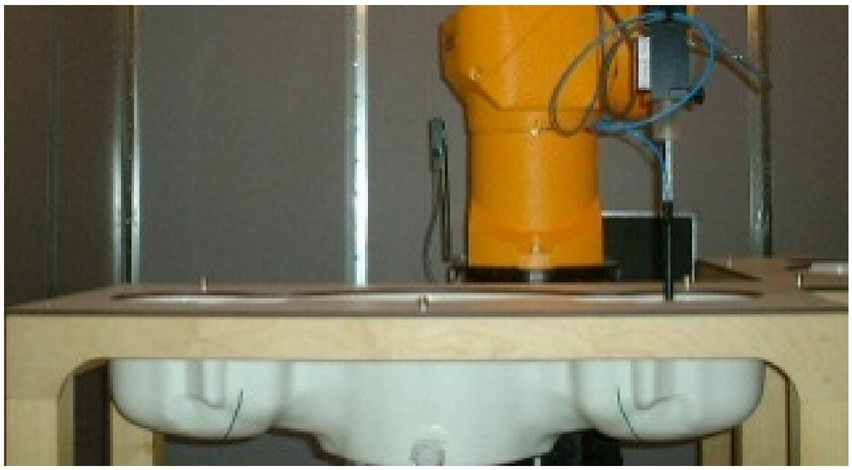


Figure 2.6 SAM Twin Phantom

Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0 the Mounting Device (see Fig. 2.7), enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can be easily, accurately, and repeat ably be positioned according to the FCC, CENELEC, IEC and IEEE specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Figure 2.7 Mounting Device

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

3. Probe and Dipole Calibration

See Appendix D and E.

4. Phantom & Simulating Tissue Specifications

Head & Body Simulating Mixture Characterization

The head and body mixtures consist of the material based on the table listed below. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. Body tissue parameters that have not been specified in P1528 are derived from the issue dielectric parameters computed from the 4-Cole-Cole equations.

Table 4.1 Typical Composition of Ingredients for Tissue

Ingredients		Simulating Tissue	
		835 MHz Head	835 MHz Body
Mixing Percentage			
Water		51.07	52.50
Sugar		47.31	45.00
Salt		1.15	1.40
HEC		0.23	1.00
Bactericide		0.24	0.10
DGBE		0.00	0.00
Dielectric Constant	Target	41.50	55.20
Conductivity (S/m)	Target	0.90	0.97

Device Holder

In combination with the SAM phantom, the mounting device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can easily, accurately, and repeatedly be positioned according to the FCC specifications. The device holder can be locked at different phantom locations (left head, right head, and uni-phantom).

5. ANSI/IEEE C95.1 – 1992 RF Exposure Limits [2]

Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have 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 applicable to situations in which persons are exposed as a consequence of their 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 5.1 Human Exposure Limits

	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIROMENT Professional Population (W/kg) or (mW/g)
SPATIAL PEAK SAR[1] Head	1.60	8.00
SPATIAL AVERAGE SAR[2] Whole Body	0.08	0.40
SPATIAL PEAK SAR[3] Hands, Feet, Ankles, Wrists	4.00	20.00

[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.

6. Measurement Uncertainty

Measurement uncertainty table is not required per KDB 865664 D01 v01 section 2.8.2 page 12. Using the ratio calculation of (1.5/1.6)*8=7.5 W/kg, shows that the measurement uncertainty table is not required since no SAR value in this report is above 7.5 W/kg.

7. System Validation

Tissue Verification

Table 7.1 Measured Tissue Parameters

		835 MHz Head		835 MHz Body	
Date(s)		Jan. 8, 2013		Jan. 7, 2013	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured
Dielectric Constant: ε		41.50	41.35	55.20	55.91
Conductivity: σ		0.90	0.92	0.97	0.99

See Appendix A for data printout.

Test System Verification

Prior to assessment, the system is verified to the ±10% of the specifications at the test frequency by using the system kit. Power is normalized to 1 watt. (Graphic Plots Attached)

Table 7.2 System Dipole Validation Target & Measured

	Test Frequency	Targeted SAR_{1g} (W/kg)	Measure SAR_{1g} (W/kg)	Tissue Used for Verification	Deviation (%)	Plot
08-Jan-2013	835 MHz	9.36	9.96	Head	+ 6.41	1
07-Jan-2013	835 MHz	9.51	9.54	Body	+ 0.32	2

See Appendix A for data plots.

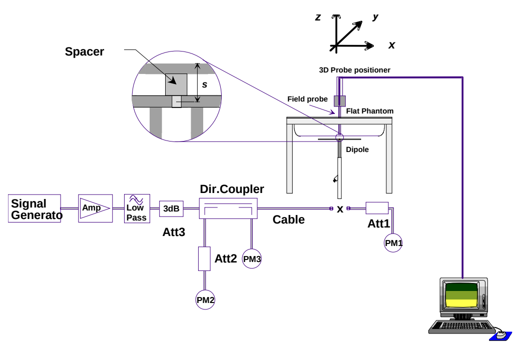


Figure 7.1 Dipole Validation Test Setup

8. SAR Test Data Summary

See Measurement Result Data Pages

See Appendix B for SAR Test Data Plots.
See Appendix C for SAR Test Setup Photos.

Procedures Used To Establish Test Signal

The device was either placed into simulated transmit mode using the manufacturer's test codes or the actual transmission is activated through a base station simulator or similar equipment. See data pages for actual procedure used in measurement.

Device Test Condition

In order to verify that the device was tested at full power, conducted output power measurements were performed before and after each SAR measurement to confirm the output power unless otherwise noted. If a conducted power deviation of more than 5% occurred, the test was repeated. The power drift of each test is measured at the start of the test and again at the end of the test. The drift percentage is calculated by the formula ((end/start)-1)*100 and rounded to three decimal places. The drift percentage is calculated into the resultant SAR value on the data sheet for each test.

The NX-420-K3 was tested in the face position with the front of the device 25 mm away from the flat phantom. The NX-420-K was then tested in the body position with the each belt clip in contact with the flat phantom. The NX-420-K was tested per KDB 149273 issued by the FCC. None of the audio devices contained an antenna; therefore, a representative sample (KMC-45) was used for all body measurements. For each of the tests conducted, the device was set to continuously transmit at a maximum output power on the channel specified in the test data. The SAR was scaled to 50% duty cycle per KDB 643646 D01 v01r01. All test reductions were reduced based on the reductions in KDB 643646 D01 v01r01 and KDB 149273 (See Appendix G). See pages 19-23 for a table of test reductions.

Optional Accessories

Accessory	**Description**	**Part Number**
Battery A	Li-Ion, 7.4V, 1480mAh	KNB-55L
Battery B	Li-Ion, 7.4V, 2000mAh	KNB-57L
Battery C	Ni-MH, 7.2V, 1400mAh	KNB-56N
Battery D	Alkaline Battery Case, 9V (6 x AA)	KBP-5
Battery E	Li-Ion, 7.4V, 1950mAh	KNB-40LCV
Body Worn A	Spring Action Belt Clip (Contains Metal) 13 mm Depth	KBH-12
Body Worn B	Leather Swivel Belt Loop with D-ring (Contains Metal) 22 mm Depth	KBH-13DS
Antenna A	800/900 MHz Whip Antenna	KRA-24M
Antenna B	800/900 MHz Whip Antenna	KRA-32
Antenna C	800/900 MHz Stubby Antenna	KRA-36
Antenna D	800/900 MHz Whip Antenna	KRA-38
Audio Accessory A	Speaker Microphone	KMC-45
Audio Accessory B	2.5mm Earphone Kit for KMC-45	KEP-2
Audio Accessory C	Heavy Duty Noise Reduction Headset Behind Head	KHS-10BH
Audio Accessory D	Heavy Duty Noise Reduction Headset Over Head	KHS-10OH
Audio Accessory E	Headset with Boom Microphone and PTT	KHS-22
Audio Accessory F	2-wire Cell-style with PTT Palm Microphone	KHS-23
Audio Accessory G	Headset with D-ring Ear Hanger	KHS-25
Audio Accessory H	Clip Microphone with Earphone	KHS-26
Audio Accessory I	D-ring Ear Hanger with PTT and Microphone	KHS-27
Audio Accessory J	Single Muff Headset with Boom Microphone	KHS-7
Audio Accessory K	Single Muff Headset with Boom Microphone	KHS-7A
Audio Accessory L	2-wire Palm Microphone with Earphone Beige	KHS-8BE
Audio Accessory M	2-wire Palm Microphone with Earphone Black	KHS-8BL
Audio Accessory N	3-wire Palm Microphone with Earphone Beige	KHS-9BE
Audio Accessory O	3-wire Palm Microphone with Earphone Black	KHS-9BL
Audio Accessory P	Speaker Microphone	KMC-21
Audio Accessory Q	GPS Microphone (2 pin type)	KMC-48GPS

None of the audio accessories have any radiating source on the accessory. Therefore, one representative accessory (A) was tested for body measurement per the table. All the audio accessories are a standard 50 ohm audio connection. Therefore, the additional audio accessories would not have any impact on the SAR value.

Low Band				High Band		
Freq	Channel	Power (dB)		Freq	Channel	Power (dB)
806	1	34.72		851	5	34.72
812	2	34.75		857	6	34.74
818	3	34.77		863	7	34.76
824	4	34.74		869	8	34.73

Per KDB 447498 D01 v05 page 7 section 4.1 6), the number of channels required to be tested is as follows:

F_{high} = 824 MHz
F_c = 815 MHz
F_{low} = 806 MHz

$N_c = \text{Round}\ \{[100(f_{high} - f_{low})/f_c]^{0.5} \times (f_c/100)^{0.2}\} = \text{Round}\ \{[100(824\text{-}806)/815]^{0.5} \times (815/100)^{0.2}\} = 2$

Therefore, for the frequency band from 802 MHz to 824 MHz, 2 channels are required for testing.

F_{high} = 869 MHz
F_c = 860 MHz
F_{low} = 851 MHz

$N_c = \text{Round}\ \{[100(f_{high} - f_{low})/f_c]^{0.5} \times (f_c/100)^{0.2}\} = \text{Round}\ \{[100(869\text{-}851)/860]^{0.5} \times (860/100)^{0.2}\} = 2$

Therefore, for the frequency band from 851 MHz to 869 MHz, 2 channels are required for testing.

Head SAR – In Front of Face								
Model	Antenna (MHz)	Channel Freq. (MHz)	Measured Power (dBm)	SAR Value (W/kg)				
				Battery A	Battery B (Default)	Battery C	Battery D	Battery E
NX-420-K3	A (806 – 824)	812	34.75	[2]	[1]	[2]	[2]	[2]
	A (806 – 824)	818	34.77	[2]	0.920	[2]	[2]	[2]
	B (806 – 824)	812	34.75	[2]	[1]	[2]	[2]	[2]
	B (806 – 824)	818	34.77	[2]	0.675	[2]	[2]	[2]
	C (806 – 824)	812	34.75	[2]	[1]	[2]	[2]	[2]
	C (806 – 824)	818	34.77	[2]	0.825	[2]	[2]	[2]
	D (806 – 824)	812	34.75	[2]	[1]	[2]	[2]	[2]
	D (806 – 824)	818	34.77	[2]	0.885	[2]	[2]	[2]
	A (851 – 869)	857	34.74	[2]	[1]	[2]	[2]	[2]
	A (851 – 869)	863	34.76	[2]	0.815	[2]	[2]	[2]
	B (851 – 869)	857	34.74	[2]	[1]	[2]	[2]	[2]
	B (851 – 869)	863	34.76	[2]	0.775	[2]	[2]	[2]
	C (851 – 869)	857	34.74	[2]	[1]	[2]	[2]	[2]
	C (851 – 869)	863	34.76	1.005	1.035	0.915	0.830	0.700
	D (851 – 869)	857	34.74	[2]	[1]	[2]	[2]	[2]
	D (851 – 869)	863	34.76	[2]	0.695	[2]	[2]	[2]
NX-420-K	A (806 – 824)	812	34.75	[3]	[3]	[3]	[3]	[3]
	A (806 – 824)	818	34.77	[3]	0.238	[3]	[3]	[3]
	B (806 – 824)	812	34.75	[3]	[3]	[3]	[3]	[3]
	B (806 – 824)	818	34.77	[3]	[3]	[3]	[3]	[3]
	C (806 – 824)	812	34.75	[3]	[3]	[3]	[3]	[3]
	C (806 – 824)	818	34.77	[3]	[3]	[3]	[3]	[3]
	D (806 – 824)	812	34.75	[3]	[3]	[3]	[3]	[3]
	D (806 – 824)	818	34.77	[3]	0.815	[3]	[3]	[3]
	A (851 – 869)	857	34.74	[3]	[3]	[3]	[3]	[3]
	A (851 – 869)	863	34.76	[3]	[3]	[3]	[3]	[3]
	B (851 – 869)	857	34.74	[3]	[3]	[3]	[3]	[3]
	B (851 – 869)	863	34.76	[3]	0.239	[3]	[3]	[3]
	C (851 – 869)	857	34.74	[3]	[3]	[3]	[3]	[3]
	C (851 – 869)	863	34.76	[3]	0.720	[3]	[3]	[3]
	D (851 – 869)	857	34.74	[3]	[3]	[3]	[3]	[3]
	D (851 – 869)	863	34.76	[3]	[3]	[3]	[3]	[3]

[1]Measurement was reduced per KDB 643646 D01 v01r01 page 2 section 1) A) I) a).
[2]Measurement was reduced per KDB 643646 D01 v01r01 page 3 section 2) B).
[3]Measurement was reduced per KDB 149273.

NX-420-K3 Body SAR w/Body Worn Accessory A								
Antenna (MHz)	Audio Accessory	Channel Freq. (MHz)	Measured Power (dBm)	SAR Value (W/kg)				
				Battery A (Default)	Battery B	Battery C	Battery D	Battery E
A (806 – 824)	A	812	34.75	[1]	[2]	[2]	[2]	[2]
	B-Q	812	34.75	[1]	[2]	[2]	[2]	[2]
	A	818	34.77	1.470	[2]	[2]	[2]	[2]
	B-Q	818	34.77	[1]	[2]	[2]	[2]	[2]
A (851 – 869)	A	857	34.74	[1]	[2]	[2]	[2]	[2]
	B-Q	857	34.74	[1]	[2]	[2]	[2]	[2]
	A	863	34.76	0.950	[2]	[2]	[2]	[2]
	B-Q	863	34.76	[1]	[2]	[2]	[2]	[2]
B (806 – 824)	A	812	34.75	[1]	[2]	[2]	[2]	[2]
	B-Q	812	34.75	[1]	[2]	[2]	[2]	[2]
	A	818	34.77	1.055	[2]	[2]	[2]	[2]
	B-Q	818	34.77	[1]	[2]	[2]	[2]	[2]
B (851 – 869)	A	857	34.74	[1]	[2]	[2]	[2]	[2]
	B-Q	857	34.74	[1]	[2]	[2]	[2]	[2]
	A	863	34.76	0.840	[2]	[2]	[2]	[2]
	B-Q	863	34.76	[1]	[2]	[2]	[2]	[2]
C (806 – 824)	A	812	34.75	[1]	[2]	[2]	[2]	[2]
	B-Q	812	34.75	[1]	[2]	[2]	[2]	[2]
	A	818	34.77	2.095	[2]	[2]	[2]	[2]
	B-Q	818	34.77	[1]	[2]	[2]	[2]	[2]
C (851 – 869)	A	857	34.74	[1]	[2]	[2]	[2]	[2]
	B-Q	857	34.74	[1]	[2]	[2]	[2]	[2]
	A	863	34.76	2.350	2.200	2.250	1.750	1.960
	B-Q	863	34.76	[1]	[2]	[2]	[2]	[2]
D (806 – 824)	A	812	34.75	[1]	[2]	[2]	[2]	[2]
	B-Q	812	34.75	[1]	[2]	[2]	[2]	[2]
	A	818	34.77	1.120	[2]	[2]	[2]	[2]
	B-Q	818	34.77	[1]	[2]	[2]	[2]	[2]
D (851 – 869)	A	857	34.74	[1]	[2]	[2]	[2]	[2]
	B-Q	857	34.74	[1]	[2]	[2]	[2]	[2]
	A	863	34.76	0.775	[2]	[2]	[2]	[2]
	B-Q	863	34.76	[1]	[2]	[2]	[2]	[2]

[1]Measurement was reduced per KDB 643646 D01 v01r01 page 5 section 1) A) I) a).
[2]Measurement was reduced per KDB 643646 D01 v01r01 page 6 section 2) C).

NX-420-K3 Body SAR w/Body Worn Accessory B								
Antenna (MHz)	Audio Accessory	Channel Freq. (MHz)	Measured Power (dBm)	SAR Value (W/kg)				
				Battery A (Default)	Battery B	Battery C	Battery D	Battery E
A (806 – 824)	A	812	34.75	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.75	[1]	[1]	[1]	[1]	[1]
	A	818	34.77	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.77	[1]	[1]	[1]	[1]	[1]
A (851 – 869)	A	812	34.74	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.74	[1]	[1]	[1]	[1]	[1]
	A	818	34.76	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.76	[1]	[1]	[1]	[1]	[1]
B (806 – 824)	A	812	34.75	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.75	[1]	[1]	[1]	[1]	[1]
	A	818	34.77	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.77	[1]	[1]	[1]	[1]	[1]
B (851 – 869)	A	812	34.74	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.74	[1]	[1]	[1]	[1]	[1]
	A	818	34.76	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.76	[1]	[1]	[1]	[1]	[1]
C (806 – 824)	A	812	34.75	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.75	[1]	[1]	[1]	[1]	[1]
	A	818	34.77	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.77	[1]	[1]	[1]	[1]	[1]
C (851 – 869)	A	812	34.74	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.74	[1]	[1]	[1]	[1]	[1]
	A	818	34.76	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.76	[1]	[1]	[1]	[1]	[1]
D (806 – 824)	A	812	34.75	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.75	[1]	[1]	[1]	[1]	[1]
	A	818	34.77	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.77	[1]	[1]	[1]	[1]	[1]
D (851 – 869)	A	812	34.74	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.74	[1]	[1]	[1]	[1]	[1]
	A	818	34.76	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.76	[1]	[1]	[1]	[1]	[1]

[1]Measurement was reduced per KDB 643646 D01 v01r01 page 7 section 4).

NX-420-K Body SAR w/Body Worn Accessory A								
Antenna (MHz)	Audio Accessory	Channel Freq. (MHz)	Measured Power (dBm)	SAR Value (W/kg)				
				Battery A (Default)	Battery B	Battery C	Battery D	Battery E
A (806 – 824)	A	812	34.75	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.75	[1]	[1]	[1]	[1]	[1]
	A	818	34.77	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.77	[1]	[1]	[1]	[1]	[1]
A (851 – 869)	A	812	34.74	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.74	[1]	[1]	[1]	[1]	[1]
	A	818	34.76	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.76	[1]	[1]	[1]	[1]	[1]
B (806 – 824)	A	812	34.75	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.75	[1]	[1]	[1]	[1]	[1]
	A	818	34.77	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.77	[1]	[1]	[1]	[1]	[1]
B (851 – 869)	A	812	34.74	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.74	[1]	[1]	[1]	[1]	[1]
	A	818	34.76	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.76	[1]	[1]	[1]	[1]	[1]
C (806 – 824)	A	812	34.75	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.75	[1]	[1]	[1]	[1]	[1]
	A	818	34.77	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.77	[1]	[1]	[1]	[1]	[1]
C (851 – 869)	A	812	34.74	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.74	[1]	[1]	[1]	[1]	[1]
	A	818	34.76	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.76	[1]	[1]	[1]	[1]	[1]
D (806 – 824)	A	812	34.75	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.75	[1]	[1]	[1]	[1]	[1]
	A	818	34.77	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.77	[1]	[1]	[1]	[1]	[1]
D (851 – 869)	A	812	34.74	[1]	[1]	[1]	[1]	[1]
	B-Q	812	34.74	[1]	[1]	[1]	[1]	[1]
	A	818	34.76	[1]	[1]	[1]	[1]	[1]
	B-Q	818	34.76	[1]	[1]	[1]	[1]	[1]

[1]Measurement was reduced per KDB 149273.

NX-420-K Body SAR w/Body Worn Accessory B								
Antenna (MHz)	Audio Accessory	Channel Freq. (MHz)	Measured Power (dBm)	SAR Value (W/kg)				
				Battery A (Default)	Battery B	Battery C	Battery D	Battery E
A (806 – 824)	A	812	34.75	1	1	1	1	1
	B-Q	812	34.75	1	1	1	1	1
	A	818	34.77	1	1	1	1	1
	B-Q	818	34.77	1	1	1	1	1
A (851 – 869)	A	812	34.74	1	1	1	1	1
	B-Q	812	34.74	1	1	1	1	1
	A	818	34.76	1	1	1	1	1
	B-Q	818	34.76	1	1	1	1	1
B (806 – 824)	A	812	34.75	1	1	1	1	1
	B-Q	812	34.75	1	1	1	1	1
	A	818	34.77	1	1	1	1	1
	B-Q	818	34.77	1	1	1	1	1
B (851 – 869)	A	812	34.74	1	1	1	1	1
	B-Q	812	34.74	1	1	1	1	1
	A	818	34.76	1	1	1	1	1
	B-Q	818	34.76	1	1	1	1	1
C (806 – 824)	A	812	34.75	1	1	1	1	1
	B-Q	812	34.75	1	1	1	1	1
	A	818	34.77	1	1	1	1	1
	B-Q	818	34.77	1	1	1	1	1
C (851 – 869)	A	812	34.74	1	1	1	1	1
	B-Q	812	34.74	1	1	1	1	1
	A	818	34.76	1	1	1	1	1
	B-Q	818	34.76	1	1	1	1	1
D (806 – 824)	A	812	34.75	1	1	1	1	1
	B-Q	812	34.75	1	1	1	1	1
	A	818	34.77	1	1	1	1	1
	B-Q	818	34.77	1	1	1	1	1
D (851 – 869)	A	812	34.74	1	1	1	1	1
	B-Q	812	34.74	1	1	1	1	1
	A	818	34.76	1	1	1	1	1
	B-Q	818	34.76	1	1	1	1	1

[1]Measurement was reduced per KDB 149273.

SAR Data Summary – Head SAR in Front of Face Measurements – K3

MEASUREMENT RESULTS

Gap	Plot	Battery	Frequency MHz	Frequency Ch.	Modulation	Antenna	End Power (dBm)	Drift (dB)	Measured SAR (W/kg)	Adjusted SAR (W/kg)	SAR (W/kg) 50% Duty Cycle
25 mm	-----	B	818	3	FM	A	34.77	-0.59	1.84	2.11	1.06
	-----		863	7	FM		34.76	+0.21	1.63	1.63	0.82
	-----		818	3	FM	B	34.77	-0.22	1.35	1.42	0.71
	-----		863	7	FM		34.76	+0.11	1.55	1.55	0.78
	-----		818	3	FM	C	34.77	+0.40	1.65	1.65	0.83
	1		863	7	FM		34.76	-0.49	2.07	2.32	1.16
	-----		818	3	FM	D	34.77	-0.60	1.77	2.03	1.02
	-----		863	7	FM		34.76	-0.30	1.39	1.49	0.75
	-----	A	863	7	FM	C	34.76	-0.26	2.01	2.13	1.07
	-----	C	863	7	FM		34.76	-0.24	1.83	1.93	0.97
	-----	D	863	7	FM		34.76	-0.27	1.66	1.77	0.89
	-----	E	863	7	FM		34.76	-0.38	1.40	1.53	0.77
	2	B	863	7	FM	C	34.76	-0.26	2.03	2.16	1.08*
	3	B	863	7	FM	C	34.76	-0.43	2.03	2.24	1.12**

Body
8.0 W/kg (mW/g)
averaged over 1 gram

1. Battery is fully charged for all tests.
   Power Measured ☒Conducted ☐ERP ☐EIRP
2. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☒Head ☐Body
3. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
4. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
5. Tissue Depth is at least 15.0 cm

Jay M. Moulton
Vice President

*Full zoom scan measurement
**Repeated measurement per KDB 865664 D01 v01 page 11

SAR Data Summary – Head SAR in Front of Face Measurements – K

MEASUREMENT RESULTS

Gap	Plot	Battery	Frequency MHz	Frequency Ch.	Modulation	Antenna	End Power (dBm)	Drift (dB)	Measured SAR (W/kg)	Adjusted SAR (W/kg)	SAR (W/kg) 50% Duty Cycle
25 mm	-----	B	818	3	FM	A	34.77	-0.08	0.476	0.485	0.24
	-----		863	7	FM	B	34.76	-0.13	0.477	0.492	0.25
	-----		818	3	FM	C	34.77	-0.21	1.44	1.51	0.76
	-----		863	7	FM	D	34.76	-0.05	1.63	1.65	0.83

Body
8.0 W/kg (mW/g)
averaged over 1 gram

1. Battery is fully charged for all tests.
   Power Measured ☒Conducted ☐ERP ☐EIRP
2. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☒Head ☐Body
3. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
4. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
5. Tissue Depth is at least 15.0 cm

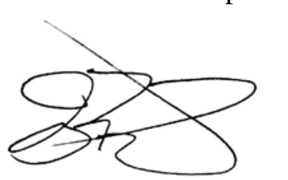
Jay M. Moulton
Vice President

SAR Data Summary – Body SAR Measurements – Body Worn Accessory A and Audio Accessory A – K3

MEASUREMENT RESULTS											
Gap	Plot	Battery	Frequency		Modulation	Antenna	End Power	Drift (dB)	Measured SAR (W/kg)	Adjusted SAR (W/kg)	SAR (W/kg) 50% Duty Cycle
			MHz	Ch.			(dBm)				
25 mm	-----	B	818	3	FM	A	34.77	-0.41	2.94	3.23	1.62
	-----		863	7	FM		34.76	-0.07	1.90	1.93	0.97
	-----		818	3	FM	B	34.77	-0.39	2.11	2.31	1.16
	-----		863	7	FM		34.76	-0.16	1.68	1.74	0.87
	-----		818	3	FM	C	34.77	+0.04	4.19	4.19	2.10
	4		863	7	FM		34.76	-0.29	4.80	5.13	2.57
	-----		818	3	FM	D	34.77	-0.42	2.24	2.47	1.24
	-----		863	7	FM		34.76	-0.22	1.55	1.63	0.82
	-----	A	863	7	FM	C	34.76	-0.29	4.40	4.70	2.35
	-----	C	863	7	FM		34.76	-0.35	4.50	4.88	2.44
	-----	D	863	7	FM		34.76	-0.29	3.50	3.74	1.87
	-----	E	863	7	FM		34.76	-0.36	3.92	4.26	2.13
	5	B	863	7	FM	C	34.76	-0.16	4.73	4.91	2.46*
	6	B	863	7	FM	C	34.76	-0.06	4.83	4.90	2.45**

Body
8.0 W/kg (mW/g)
averaged over 1 gram

1. Battery is fully charged for all tests.
   Power Measured ☒Conducted ☐ERP ☐EIRP
2. SAR Measurement
   Phantom Configuration ☐Left Head ☒Eli4 ☐Right Head
   SAR Configuration ☐Head ☒Body
3. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
4. Test Configuration ☒With Belt Clip ☐Without Belt Clip ☐N/A
5. Tissue Depth is at least 15.0 cm



Jay M. Moulton
Vice President

*Full zoom scan measurement
**Repeated measurement per KDB 865664 D01 v01 page 11

9. Test Equipment List

Table 9.1 Equipment Specifications

Type	Calibration Due Date	Calibration Done Date	Serial Number
Staubli Robot TX60L	N/A	N/A	F07/55M6A1/A/01
Measurement Controller CS8c	N/A	N/A	1012
ELI4 Flat Phantom	N/A	N/A	1065
Device Holder	N/A	N/A	N/A
Data Acquisition Electronics 4	08/15/2012	08/15/2013	759
SAR Software V52.8.2.969	N/A	N/A	N/A
SPEAG E-Field Probe EX3DV4	08/20/2013	08/20/2012	3693
Speag Validation Dipole D835V2	12/03/2013	12/03/2012	4d089
Agilent N1911A Power Meter	03/29/2013	03/29/2012	GB45100254
Agilent N1922A Power Sensor	03/29/2013	03/29/2012	MY45240464
Advantest R3261A Spectrum Analyzer	03/29/2013	03/29/2012	31720068
Agilent (HP) 8350B Signal Generator	03/29/2013	03/29/2012	2749A10226
Agilent (HP) 83525A RF Plug-In	03/29/2013	03/29/2012	2647A01172
Agilent (HP) 8753C Vector Network Analyzer	03/29/2013	03/29/2012	3135A01724
Agilent (HP) 85047A S-Parameter Test Set	04/03/2013	04/03/2012	2904A00595
Agilent (HP) 8960 Base Station Sim.	04/05/2014	04/05/2012	MY48360364
Anritsu MT8820C	08/03/2014	08/03/2012	6201176199
Aprel Dielectric Probe Assembly	N/A	N/A	0011
Body Equivalent Matter (835/900 MHz)	N/A	N/A	N/A
Head Equivalent Matter (835/900 MHz)	N/A	N/A	N/A

10. 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 exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect to all 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 is a very complex phenomena that depends on the mass, shape, and size of the body; the orientation of the body with respect to the field vectors; and, the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects 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 of an 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.

11. References

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio Frequency Radiation, August 1996

[2] ANSI/IEEE C95.1 – 1992, American National Standard Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300kHz to 100GHz, New York: IEEE, 1992.

[3] ANSI/IEEE C95.3 – 1992, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, 1992.

[4] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, June 2001.

[5] IEEE Standard 1528 – 2003, IEEE Recommended Practice for Determining the Peak-Spatial Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques, October 2003.

[6] Industry Canada, RSS – 102e, Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), March 2010.

[7] Health Canada, Safety Code 6, Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3kHz to 300 GHz, 2009.

Appendix A – System Validation Plots and Data

```
************************************************************
Test Result for UIM Dielectric Parameter
Tue 08/Jan/2013 11:58:42
Freq  Frequency(GHz)
FCC_eH      FCC Bulletin 65 Supplement C ( June 2001) Limits for Head Epsilon
FCC_sH      FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB      FCC Limits for Body Epsilon
FCC_sB      FCC Limits for Body Sigma
Test_e      Epsilon  of  UIM
Test_s      Sigma of UIM
************************************************************
```

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.8050	41.66	0.90	41.53	0.90
0.8150	41.60	0.90	41.47	0.91
0.8180	41.585	0.90	41.452	0.91*
0.8250	41.55	0.90	41.41	0.91
0.8350	41.50	0.90	41.35	0.92
0.8450	41.50	0.91	41.32	0.92
0.8550	41.50	0.92	41.30	0.93
0.8630	41.50	0.928	41.292	0.938*
0.8650	41.50	0.93	41.29	0.94
0.8750	41.50	0.94	41.26	0.94
0.8950	41.50	0.95	41.24	0.95
0.8950	41.50	0.96	41.21	0.96

*value interpolated

```
************************************************************
Test Result for UIM Dielectric Parameter
Mon 07/Jan/2013 02:18:38
Freq  Frequency(GHz)
FCC_eH      FCC Bulletin 65 Supplement C ( June 2001) Limits for Head Epsilon
FCC_sH      FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB      FCC Limits for Body Epsilon
FCC_sB      FCC Limits for Body Sigma
Test_e      Epsilon  of  UIM
Test_s      Sigma of UIM
************************************************************
```

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.8050	55.32	0.97	56.05	0.96
0.8150	55.28	0.97	56.00	0.98
0.8180	55.268	0.97	55.985	0.98*
0.8250	55.24	0.97	55.95	0.98
0.8350	55.20	0.97	55.91	0.99
0.8450	55.17	0.98	55.86	0.99
0.8550	55.14	0.99	55.84	1.00
0.8630	55.116	1.006	55.808	1.008*
0.8650	55.11	1.01	55.80	1.01
0.8750	55.08	1.02	55.78	1.03
0.8850	55.05	1.03	55.73	1.03
0.8950	55.02	1.04	55.70	1.04

*value interpolated

RF Exposure Lab

Plot 1

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:4d089

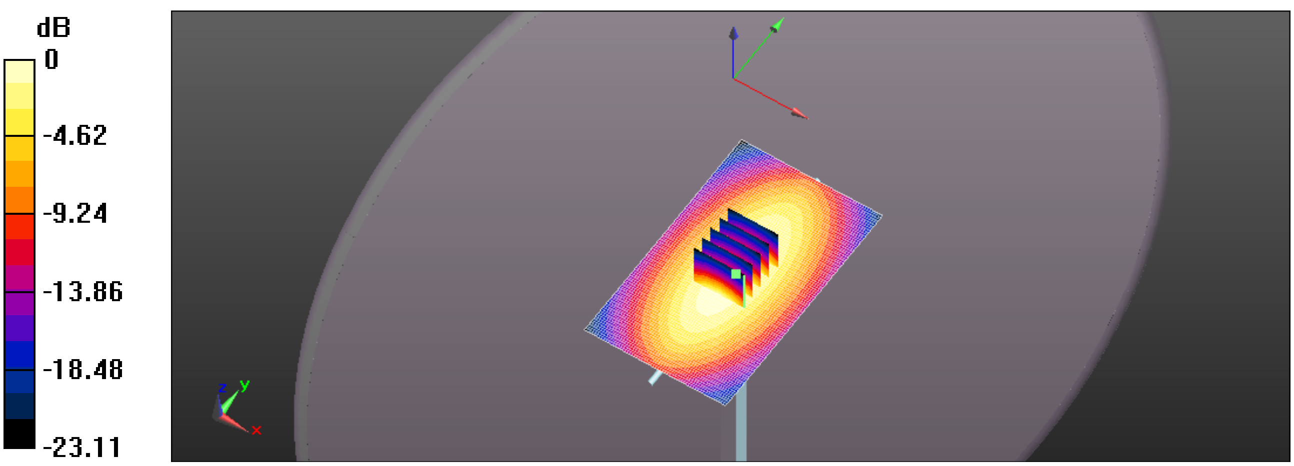
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used: f = 835 MHz; σ = 0.92 mho/m; ε_r = 41.35; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 1/8/2013; Ambient Temp: 23 °C; Tissue Temp: 20 °C
Probe: EX3DV4 - SN3693; ConvF(8.55, 8.55, 8.55); Calibrated: 8/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

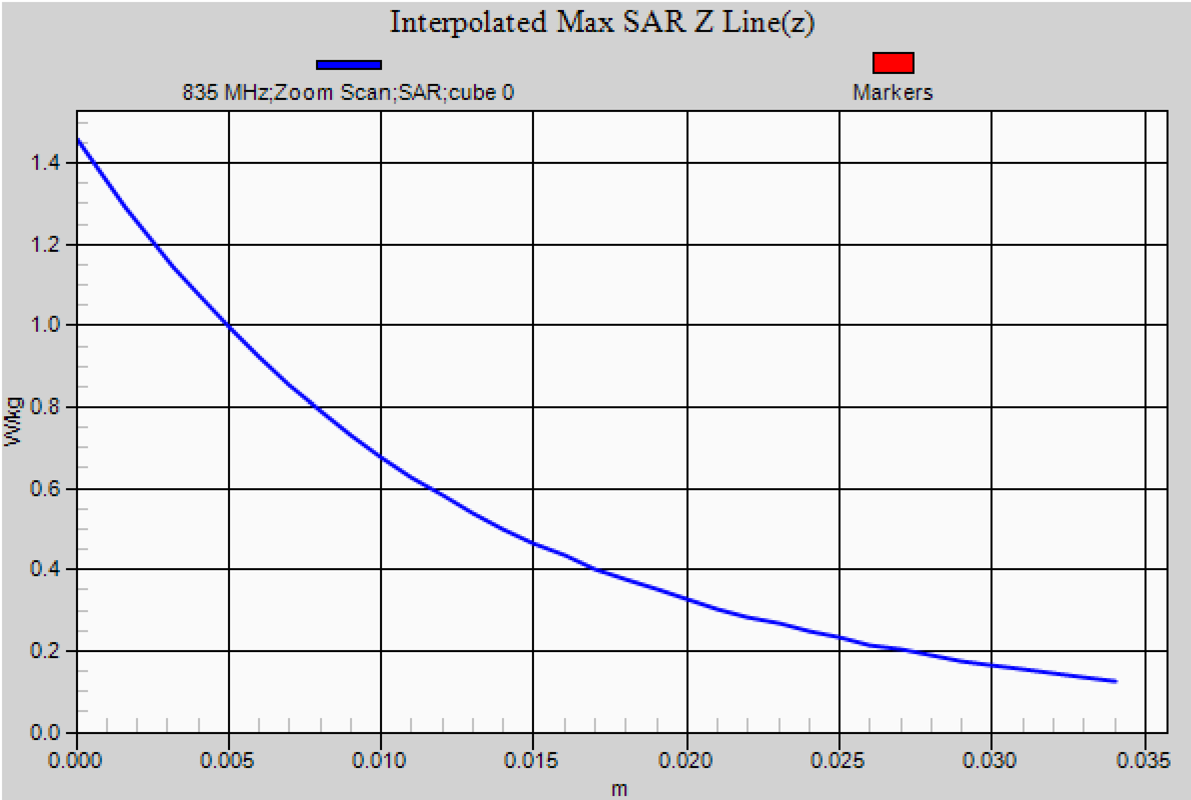
Procedure Notes:

Head Verification/835 MHz/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.08 W/kg

Head Verification/835 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 34.785 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 1.458 mW/g
SAR(1 g) = 0.996 mW/g; SAR(10 g) = 0.655 mW/g
Maximum value of SAR (measured) = 1.08 W/kg



0 dB = 1.08 W/kg = 0.66 dB W/kg


Interpolated Max SAR Z Line(z)
835 MHz;Zoom Scan;SAR;cube 0
Markers
W/kg
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

RF Exposure Lab

Plot 2

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:4d089

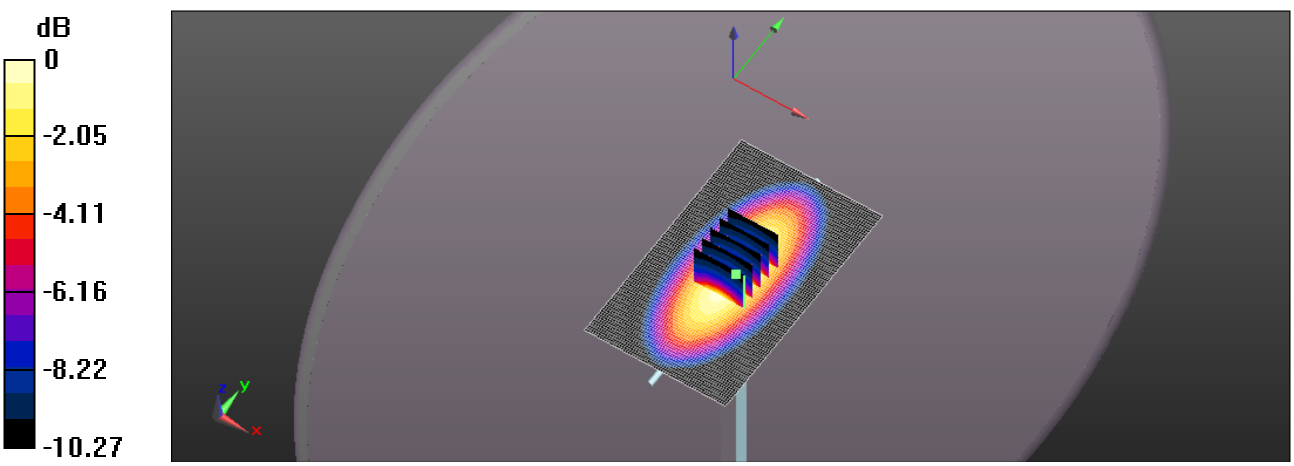
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 55.91; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: 1/7/2013; Ambient Temp: 23 °C; Tissue Temp: 20 °C
Probe: EX3DV4 - SN3693; ConvF(8.87, 8.87, 8.87); Calibrated: 8/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

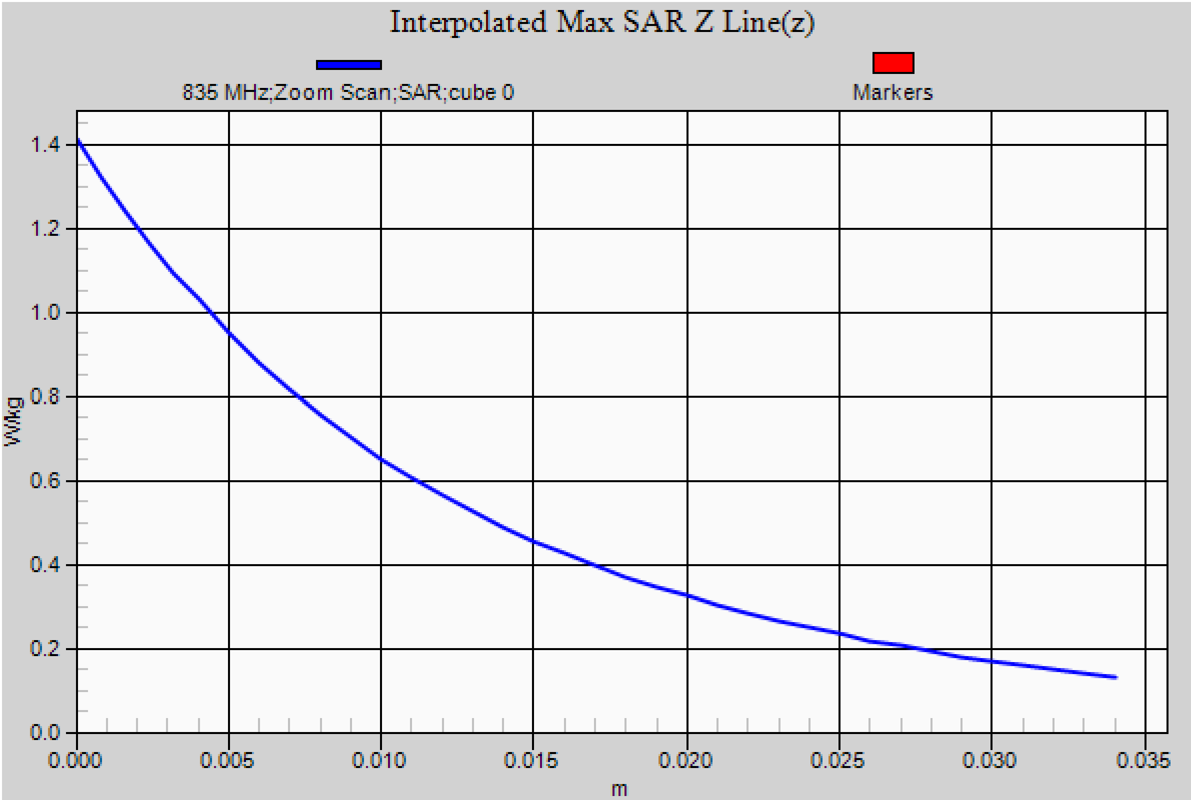
Procedure Notes:

Body Verification/835 MHz/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.03 W/kg

Body Verification/835 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.199 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.412 mW/g
SAR(1 g) = 0.954 mW/g; SAR(10 g) = 0.628 mW/g
Maximum value of SAR (measured) = 1.03 W/kg



0 dB = 1.03 W/kg = 0.26 dB W/kg


Interpolated Max SAR Z Line(z)
835 MHz;Zoom Scan;SAR;cube 0
Markers
W/kg
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Appendix B – SAR Test Data Plots

RF Exposure Lab

DUT: NX-420; Type: PTT; Serial: 0438

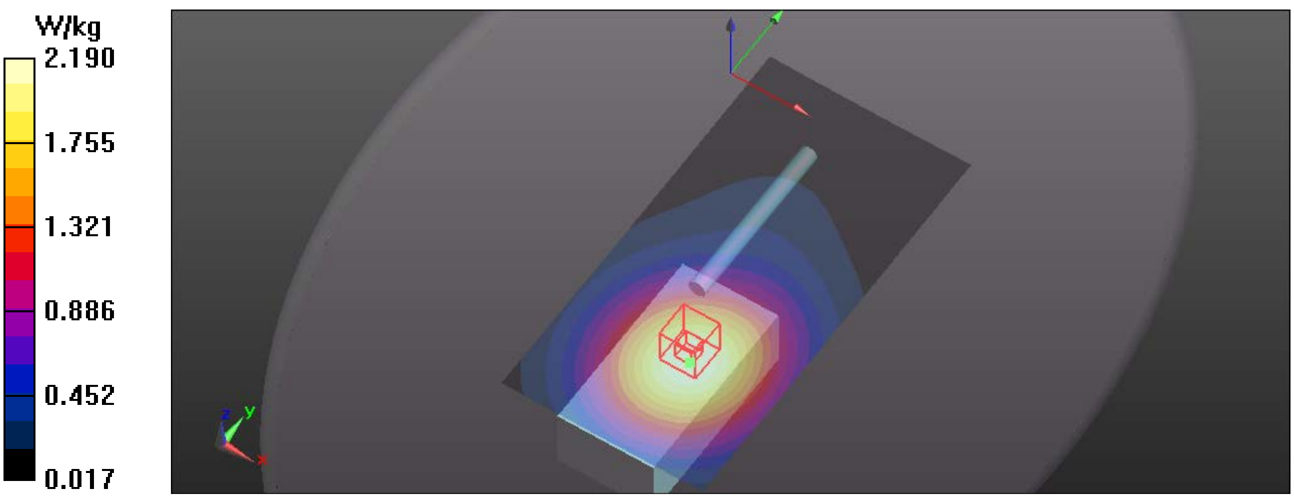
Communication System: FM; Frequency: 863 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): f = 863 MHz; σ = 0.938 mho/m; ε_r = 41.292; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 1/8/2013; Ambient Temp: 23 °C; Tissue Temp: 20 °C
Probe: EX3DV4 - SN3693; ConvF(8.55, 8.55, 8.55); Calibrated: 8/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Procedure Notes:

Face/K3, KNB-57L, KRA-36 High/Area Scan (81x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 30.633 V/m; Power Drift = -0.49 dB
Fast SAR: SAR(1 g) = 2.07 mW/g; SAR(10 g) = 1.46 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 2.19 W/kg



RF Exposure Lab

DUT: NX-420; Type: PTT; Serial: 0438

Communication System: FM; Frequency: 863 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): f = 863 MHz; σ = 0.938 mho/m; ε_r = 41.292; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 1/8/2013; Ambient Temp: 23 °C; Tissue Temp: 20 °C
Probe: EX3DV4 - SN3693; ConvF(8.55, 8.55, 8.55); Calibrated: 8/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

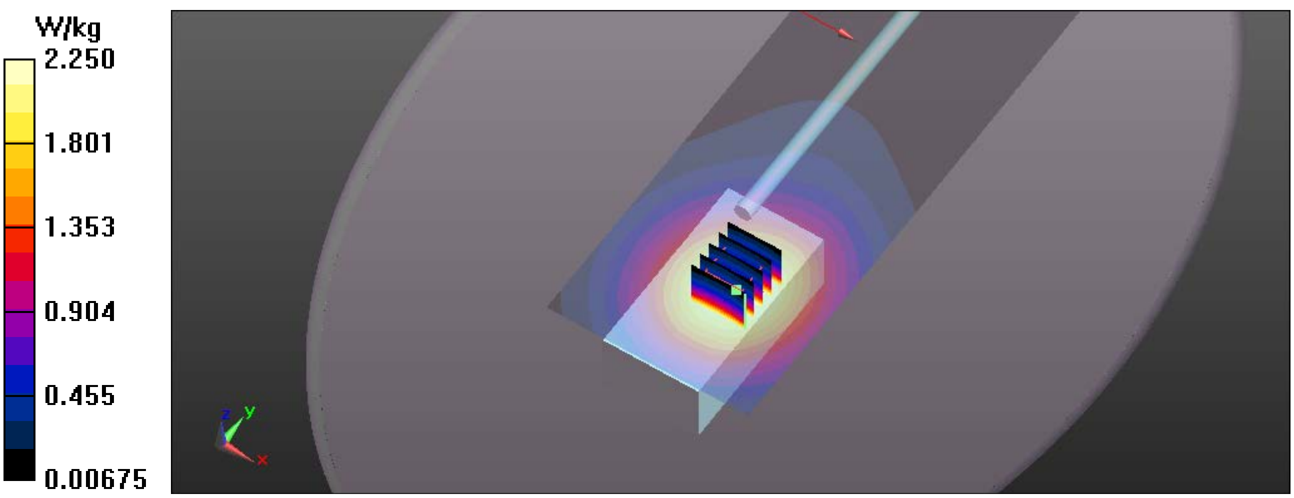
Procedure Notes:

Face/K3, KNB-57L, KRA-36 High SAR/Area Scan (81x201x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 2.25 W/kg

Face/K3, KNB-57L, KRA-36 High SAR/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.755 V/m; Power Drift = -0.26 dB
Peak SAR (extrapolated) = 2.819 mW/g
SAR(1 g) = 2.03 mW/g; SAR(10 g) = 1.5 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.55 W/kg



RF Exposure Lab

DUT: NX-420; Type: PTT; Serial: 0438

Communication System: FM; Frequency: 863 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): f = 863 MHz; σ = 0.938 mho/m; ε_r = 41.292; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 1/8/2013; Ambient Temp: 23 °C; Tissue Temp: 20 °C
Probe: EX3DV4 - SN3693; ConvF(8.55, 8.55, 8.55); Calibrated: 8/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

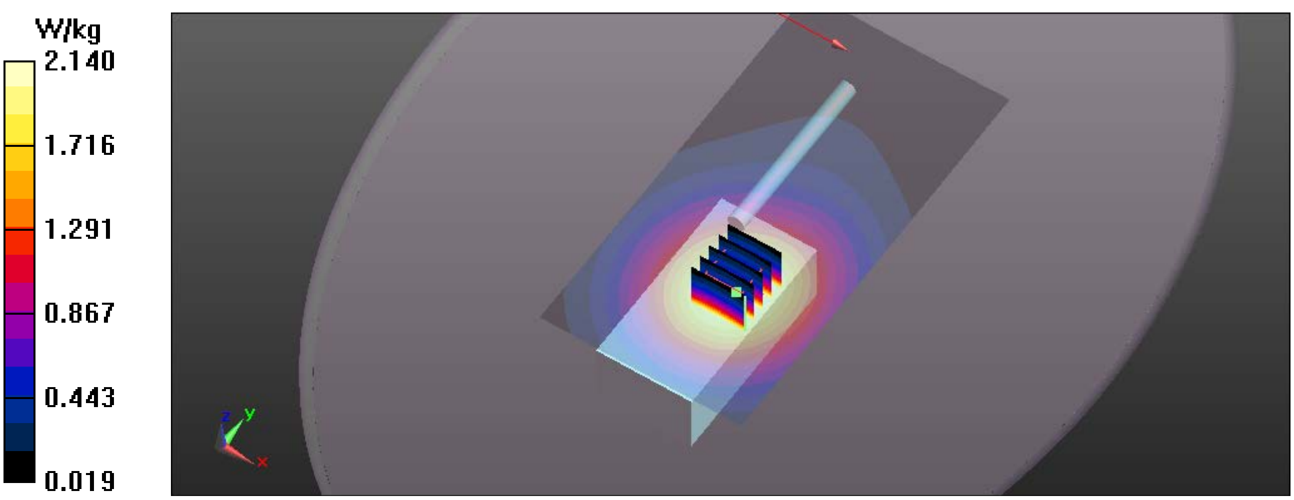
Procedure Notes:

Face/K3, KNB-57L, KRA-36 High Repeat/Area Scan (81x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 2.14 W/kg

Face/K3, KNB-57L, KRA-36 High Repeat/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.448 V/m; Power Drift = -0.43 dB
Peak SAR (extrapolated) = 2.789 mW/g
SAR(1 g) = 2.03 mW/g; SAR(10 g) = 1.48 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.50 W/kg



RF Exposure Lab

DUT: NX-420; Type: PTT; Serial: 0438

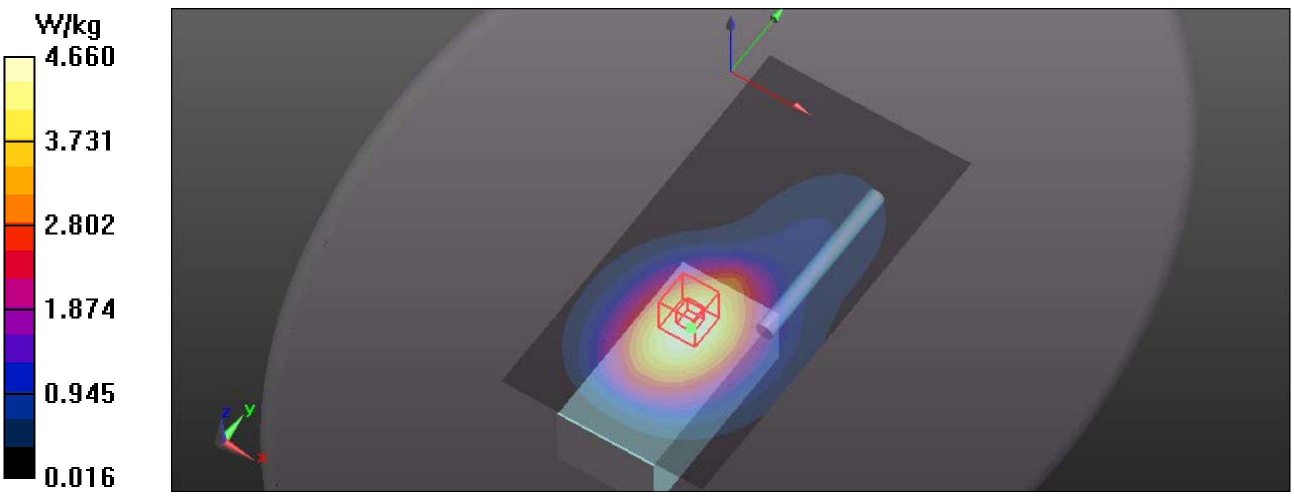
Communication System: FM; Frequency: 863 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used (interpolated): f = 863 MHz; σ = 1.008 mho/m; ε_r = 55.808; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 1/8/2013; Ambient Temp: 23 °C; Tissue Temp: 20 °C
Probe: EX3DV4 - SN3693; ConvF(8.87, 8.87, 8.87); Calibrated: 8/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

Procedure Notes:

Body/K3, KBH-12, KNB-55L, KRA-36 High/Area Scan (81x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 55.913 V/m; Power Drift = -0.29 dB
Fast SAR: SAR(1 g) = 4.8 mW/g; SAR(10 g) = 3.05 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 4.96 W/kg



RF Exposure Lab

DUT: NX-420; Type: PTT; Serial: 0438

Communication System: FM; Frequency: 863 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used (interpolated): f = 863 MHz; σ = 1.008 mho/m; ε_r = 55.808; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 1/8/2013; Ambient Temp: 23 °C; Tissue Temp: 20 °C
Probe: EX3DV4 - SN3693; ConvF(8.87, 8.87, 8.87); Calibrated: 8/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

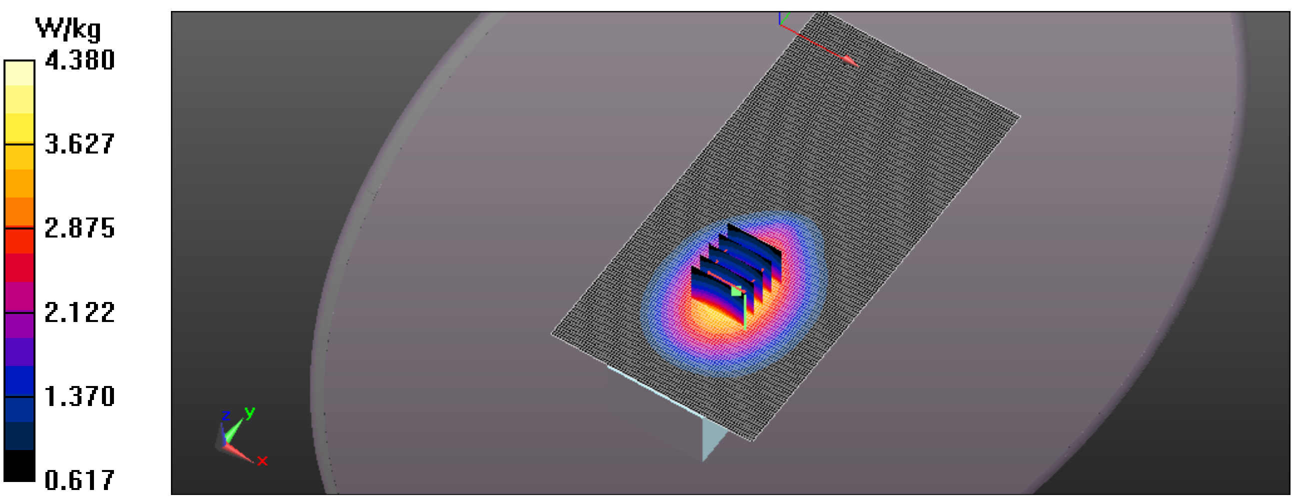
Procedure Notes:

Body/K3, KBH-12, KNB-55L, KRA-36 High SAR/Area Scan (81x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 3.99 W/kg

Body/K3, KBH-12, KNB-55L, KRA-36 High SAR/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 50.111 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 4.834 mW/g
SAR(1 g) = 4.75 mW/g; SAR(10 g) = 2.94 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 4.38 W/kg



RF Exposure Lab

DUT: NX-420; Type: PTT; Serial: 0438

Communication System: FM; Frequency: 863 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used (interpolated): f = 863 MHz; σ = 1.008 mho/m; ε_r = 55.808; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 1/8/2013; Ambient Temp: 23 °C; Tissue Temp: 20 °C
Probe: EX3DV4 - SN3693; ConvF(8.87, 8.87, 8.87); Calibrated: 8/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (2); SEMCAD X Version 14.6.6 (6824)

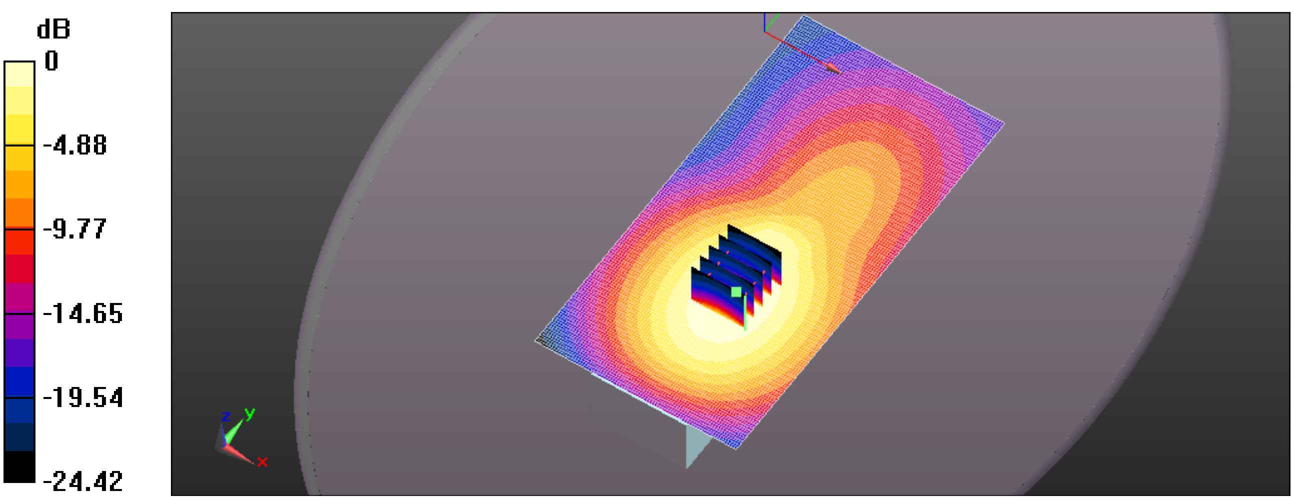
Procedure Notes:

Body/K3, KBH-12, KNB-55L, KRA-36 High Repeat/Area Scan (81x161x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 5.36 W/kg

Body/K3, KBH-12, KNB-55L, KRA-36 High Repeat/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 59.156 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 6.555 mW/g
SAR(1 g) = 4.83 mW/g; SAR(10 g) = 3.57 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 5.97 W/kg



0 dB = 5.36 W/kg = 14.58 dB W/kg

Appendix C – SAR Test Setup Photos

Handset with Antenna A Face Configuration

Handset with Antenna B Face Configuration

Handset with Antenna C Face Configuration

Handset with Antenna D Face Configuration

Audio Accessory A with Antenna A Body Configuration

Audio Accessory A with Antenna B Body Configuration

Audio Accessory A with Antenna C Body Configuration

Audio Accessory A with Antenna D Body Configuration

Front of Device – K3

Back of Device – K3

Front of Device – K

Back of Device – K

Antenna A

Antenna B

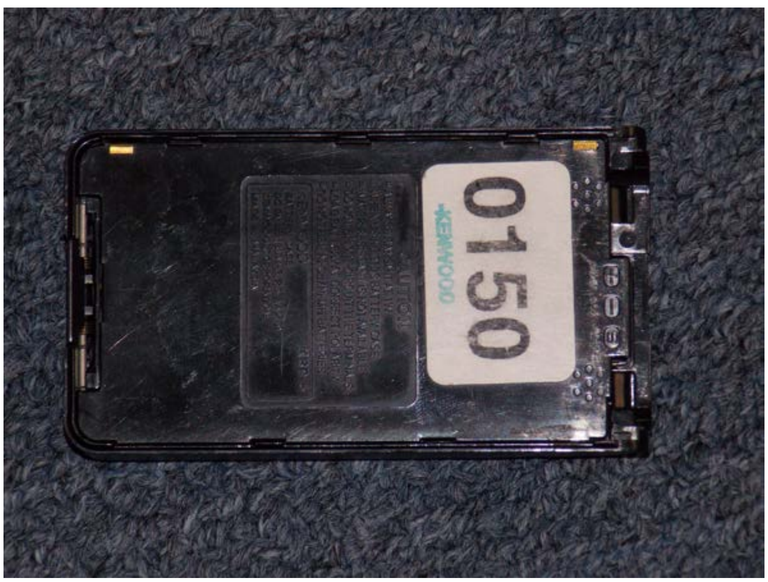
Antenna C

Antenna D

Battery A

Battery B

Battery C



Battery D


CAUTION
KNB-40LCV
CELL MADE IN CHINA
PACK ASSEMBLED IN MEXICO
KENWOOD U.S.A. CORPORATION

Battery E

Appendix D – Probe Calibration Data Sheets

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 **RF Exposure Lab**

Certificate No: EX3-3693_Aug12

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3693

Calibration procedure(s): QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: August 20, 2012

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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: August 20, 2012

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

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	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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

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, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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.

Probe EX3DV4

SN:3693

Manufactured: April 22, 2009
Calibrated: August 20, 2012

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3693

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.49	0.48	0.46	± 10.1 %
DCP (mV)[B]	98.3	100.5	98.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	161.4	±3.0 %
			Y	0.00	0.00	1.00	154.4	
			Z	0.00	0.00	1.00	158.9	

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:3693

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	Depth (mm)	Unct. (k=2)
750	41.9	0.89	8.99	8.99	8.99	0.23	1.20	± 12.0 %
835	41.5	0.90	8.55	8.55	8.55	0.18	1.56	± 12.0 %
1750	40.1	1.37	8.00	8.00	8.00	0.51	0.76	± 12.0 %
1900	40.0	1.40	7.67	7.67	7.67	0.75	0.63	± 12.0 %
2450	39.2	1.80	6.72	6.72	6.72	0.29	1.09	± 12.0 %
2550	39.1	1.91	6.55	6.55	6.55	0.39	0.93	± 12.0 %
5200	36.0	4.66	4.97	4.97	4.97	0.30	1.80	± 13.1 %
5300	35.9	4.76	4.78	4.78	4.78	0.30	1.80	± 13.1 %
5600	35.5	5.07	4.22	4.22	4.22	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.34	4.34	4.34	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.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3693

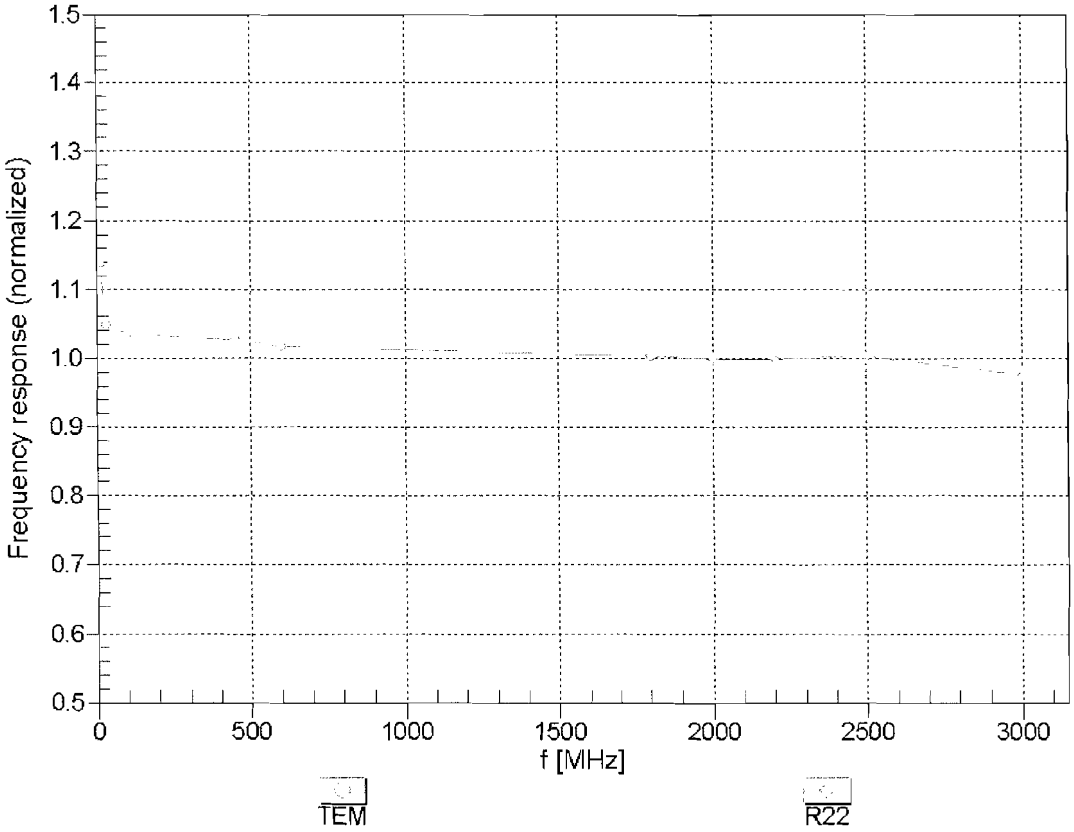
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	8.84	8.84	8.84	0.29	1.09	± 12.0 %
835	55.2	0.97	8.87	8.87	8.87	0.60	0.71	± 12.0 %
1750	53.4	1.49	7.43	7.43	7.43	0.41	0.85	± 12.0 %
1900	53.3	1.52	7.13	7.13	7.13	0.41	0.82	± 12.0 %
2450	52.7	1.95	6.76	6.76	6.76	0.80	0.50	± 12.0 %
2550	52.6	2.09	6.75	6.75	6.75	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.31	4.31	4.31	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.24	4.24	4.24	0.40	1.90	± 13.1 %
5600	48.5	5.77	3.76	3.76	3.76	0.45	1.90	± 13.1 %
5800	48.2	6.00	4.08	4.08	4.08	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.

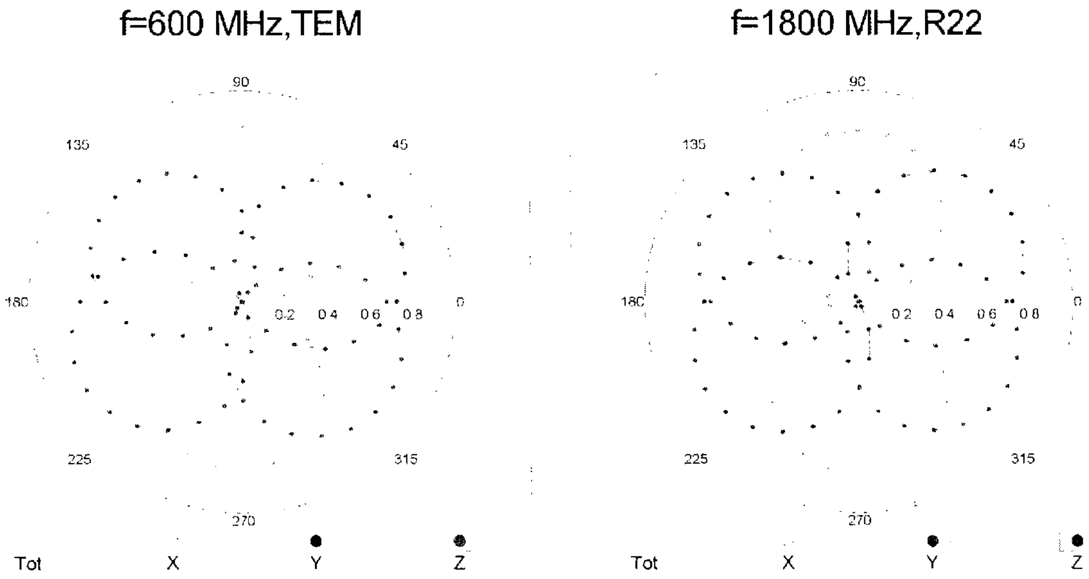
Frequency Response of E-Field

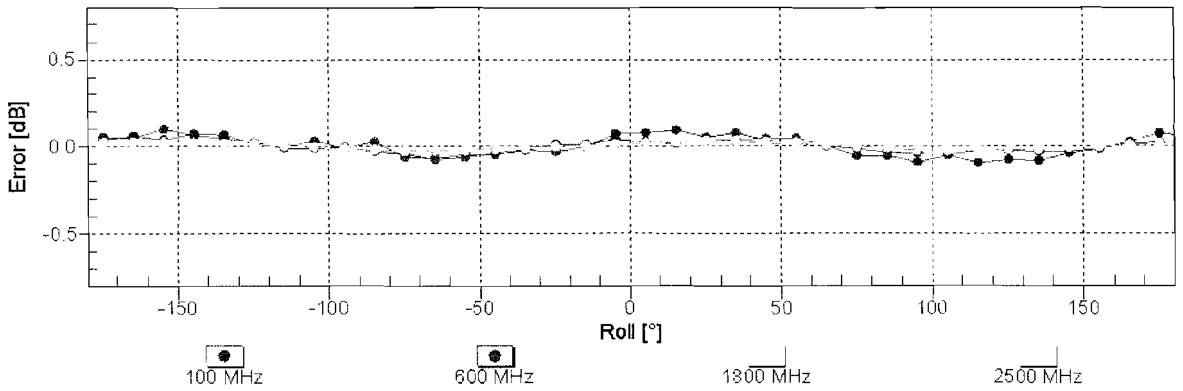
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

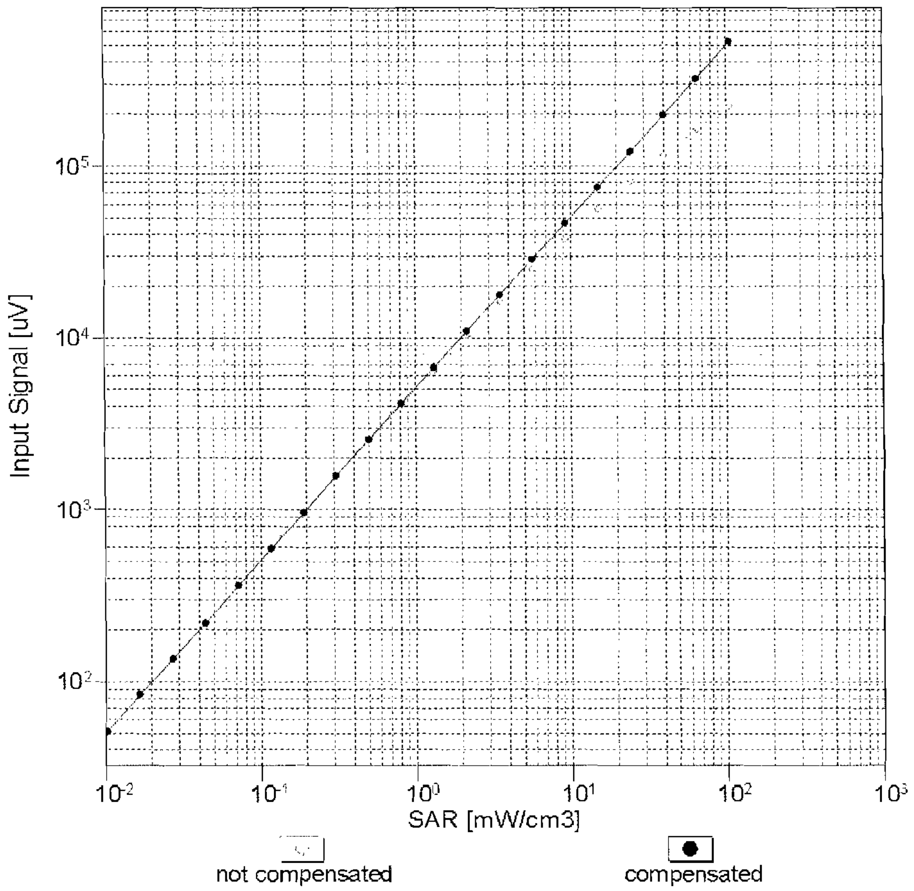
Receiving Pattern (φ), ϑ = 0°

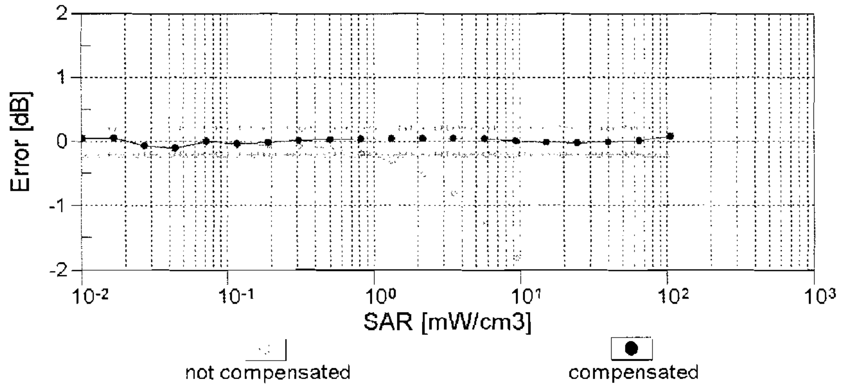




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

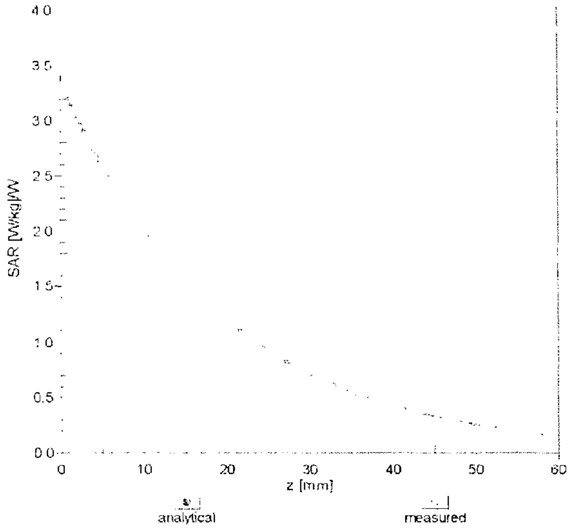




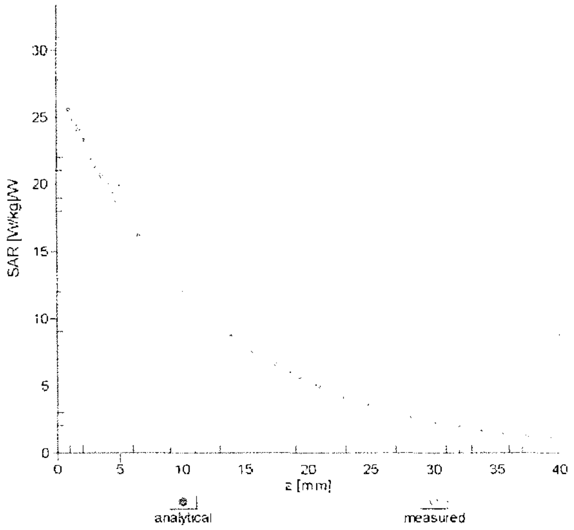
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

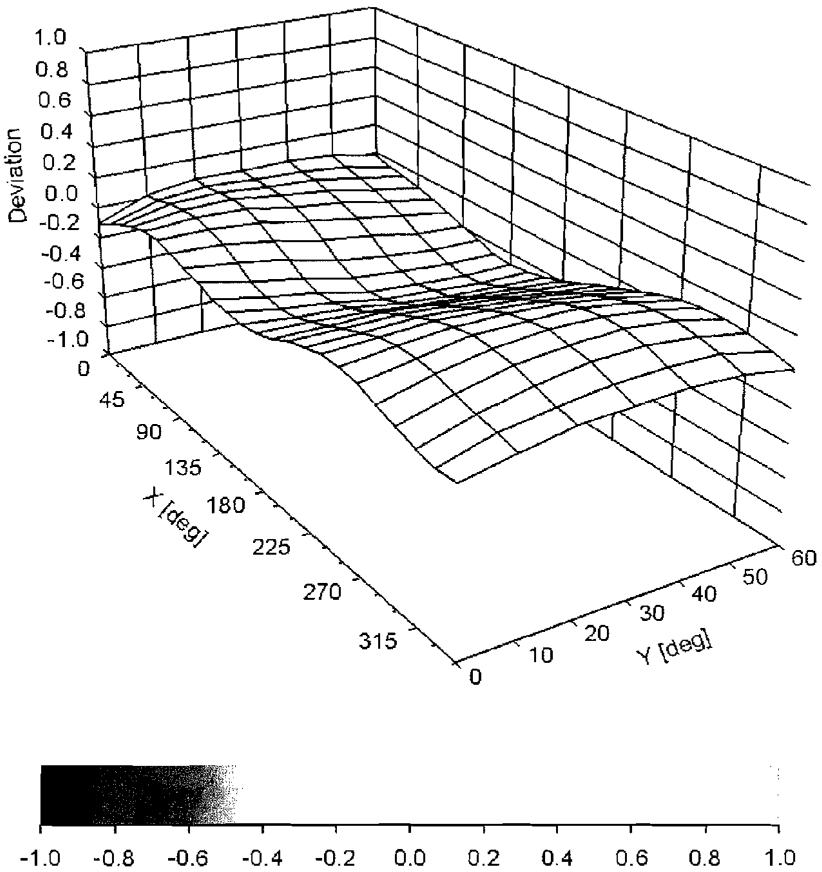


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3693

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	155.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

Appendix E – Dipole Calibration Data Sheets

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 **RF Exposure Lab**

Certificate No: D835V2-4d089_Dec12

CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d089

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: December 03, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: December 3, 2012

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

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	V52.8.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.4 ± 6 %	0.92 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	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.36 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.12 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	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.5 ± 6 %	0.99 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	2.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.51 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.27 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.7 Ω - 2.5 jΩ
Return Loss	- 30.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω - 4.8 jΩ
Return Loss	- 25.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 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	October 17, 2008

Date: 03.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d089

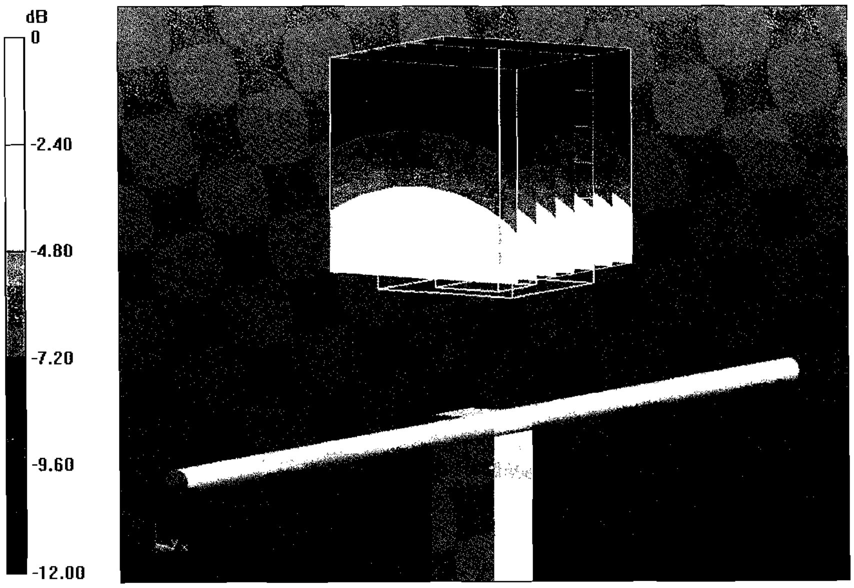
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

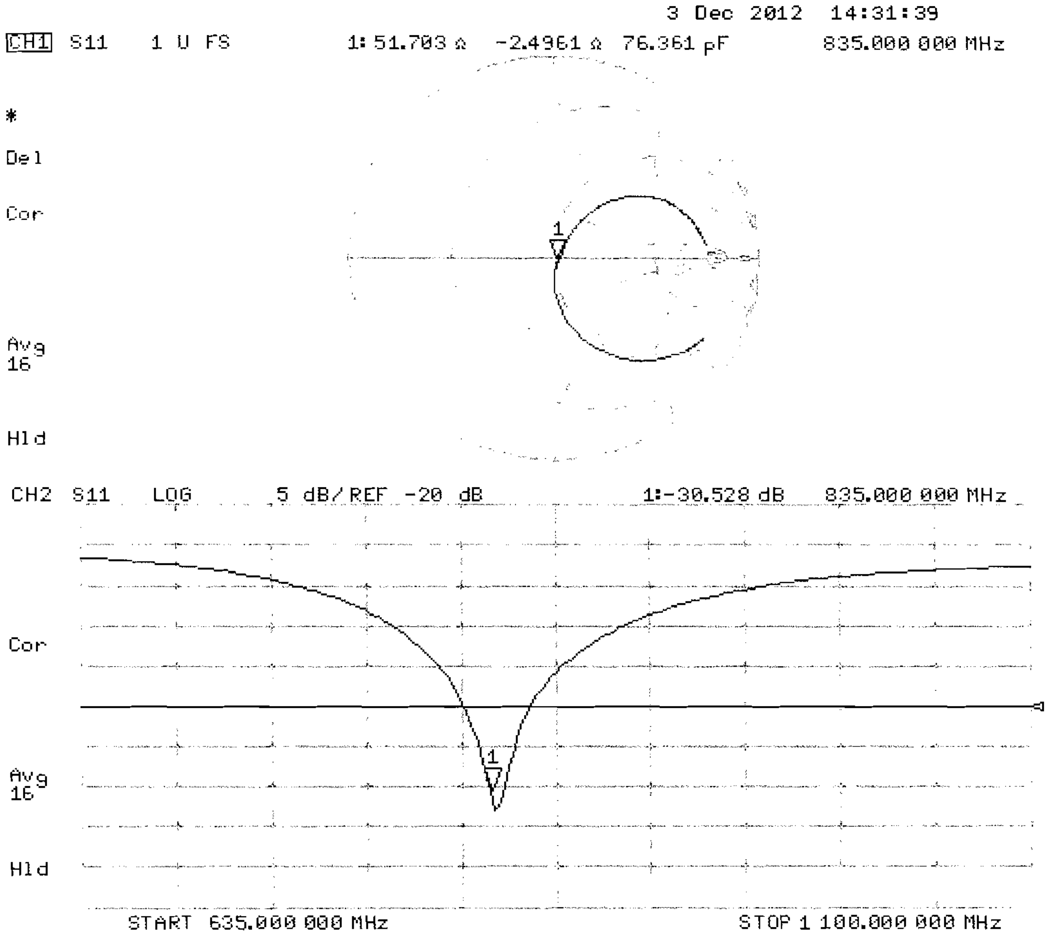
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.782 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 2.79 W/kg



0 dB = 2.79 W/kg = 4.46 dBW/kg

Impedance Measurement Plot for Head TSL



Date: 03.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d089

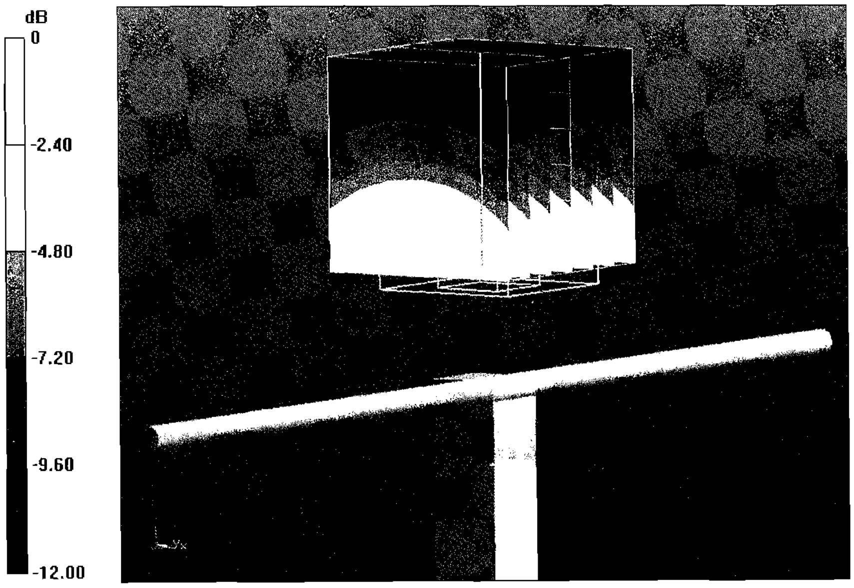
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

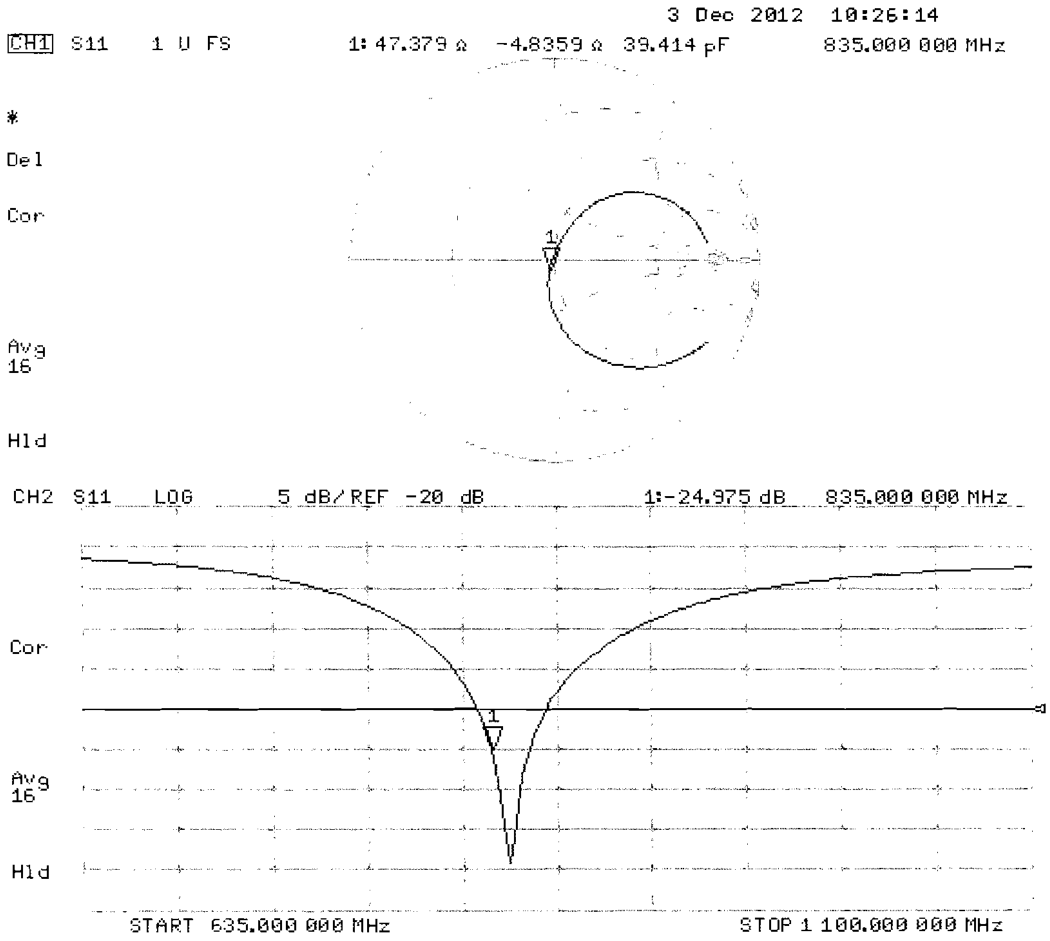
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.384 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.54 W/kg
SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 2.82 W/kg



0 dB = 2.82 W/kg = 4.50 dBW/kg

Impedance Measurement Plot for Body TSL



Appendix F – Phantom Calibration Data Sheets

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Certificate of Conformity / First Article Inspection

Item	Oval Flat Phantom ELI 4.0
Type No	QD OVA 001 B
Series No	1003 and higher
Manufacturer	Untersee Composites Knebelstrasse 8 CH-8268 Mannenbach, Switzerland

Tests
Complete tests were made on the prototype units QD OVA 001 AA 1001, QD OVA 001 AB 1002, pre-series units QD OVA 001 BA 1003-1005 as well as on the series units QD OVA 001 BB, 1006 ff.

Test	Requirement	Details	Units tested
Material thickness	Compliant with the standard requirements	Bottom plate: 2.0mm +/- 0.2mm	all
Material parameters	Dielectric parameters for required frequencies	< 6 GHz: Rel. permittivity = 4 +/-1, Loss tangent ≤ 0.05	Material sample
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions.	DGBE based simulating liquids. Observe Technical Note for material compatibility.	Equivalent phantoms, Material sample
Shape	Thickness of bottom material, Internal dimensions, Sagging compatible with standards from minimum frequency	Bottom elliptical 600 x 400 mm Depth 190 mm, Shape is within tolerance for filling height up to 155 mm, Eventual sagging is reduced or eliminated by support via DUT	Prototypes, Sample testing

Standards

[1] CENELEC EN 50361-2001, « Basic standard for the measurement of the Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz – 3 GHz) », July 2001
[2] IEEE 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques, December 2003
[3] IEC 62209 – 1, "Specific Absorption Rate (SAR) in the frequency range of 300 MHz to 3 GHz – Measurement Procedure, Part 1: Hand-held mobile wireless communication devices", February 2005
[4] IEC 62209 – 2, Draft, "Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices – Human models, Instrumentation and Procedures – Part 2: Procedure to determine the Specific Absorption Rate (SAR) in the head and body for 30 MHz to 6 GHz Handheld and Body-Mounted Devices used in close proximity to the Body.", February 2005
[5] OET Bulletin 65, Supplement C, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", Edition January 2001

Based on the tests above, we certify that this item is in compliance with the standards [1] to [5] if operated according to the specific requirements and considering the thickness. The dimensions are fully compliant with [4] from 30 MHz to 6 GHz. For the other standards, the minimum lower frequency limit is limited due to the dimensional requirements ([1]: 450 MHz, [2]: 300 MHz, [3]: 800 MHz, [5]: 375 MHz) and possibly further by the dimensions of the DUT.

Date 28.4.2008 **Signature / Stamp**

s p e a g
Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Appendix G – KDB 149273

Office of Engineering and Technology

Tracking Number 149273

FCC response on 11/01/2012

Assuming that the model with keypad and LCD is the worst case for SAR, it would be our reference and let us call it Model A. Full evaluation of this reference model should be performed in accordance with KDB 643646. The down-featured variant, call it Model B, can be tested according to the following guidelines. (If Model B turns out to be the worst case, then it should be the reference and fully tested.)

1. For face exposure, Model B should be measured for each of the 4 antennas using the highest SAR configuration reported among the battery configurations for Model A; i.e., one SAR per antenna.

2. For body-worn exposure, Model B should be measured for each of the 4 antenna and 2 belt clip options using the highest SAR configuration reported among the battery and audio accessory combinations for Model A; i.e., one SAR per antenna and body-worn accessory combination (8 tests for the 4 antennas and 2 belt clips). For each of these 8 configurations, if the measured SAR for Model B is > 7.0 W/kg repeat all SAR measured for Model A that are > 6.0 W/kg using Model B. In addition, all SAR measured for Model A that is > 7.0 W/kg must be repeated for Model B regardless of configuration. However, if the highest reported SAR for a Model A combination is < 5.0 W/kg, no test is needed for that combination.

The above SAR should mean the measured results evaluated at 50% duty factor (or less if justified such as > 2 slot TDMA) after power droop compensation but before component tolerance scale-up. A table similar to that illustrated on Page 9 of KDB 643646 should be used in the SAR report to explain test cases. Any test reduction/exclusion based on KDB 643646 should be clearly noted and justified.

Please identify this KDB inquiry and include the above procedures in the SAR report.

Attachment Details: