RF Exposure Lab

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CERTIFICATE OF COMPLIANCE
SAR EVALUATION

Intel Corporation		Dates of Test:	Jan. 25-Feb. 2, 2013
100 Center Point Circle, Suite 200		Test Report Number:	SAR.20130203
Columbia, SC 29210			

FCC ID:	PD97260NG & PD97260NGU
IC Certificate:	1000M-7260NG
Model(s):	7260NGW
Test Sample:	Engineering Unit Same as Production
MAC Address:	001500B664F3
Equipment Type:	Wireless Module
Classification:	Portable Transmitter Next to Body
TX Frequency Range:	2412 – 2462 MHz; 5180 – 5320 MHz; 5500 – 5700 MHz; 5745 – 5825 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	2450 MHz (b) – 15.50 dB, 2450 MHz (g) – 16.50 dB, 2450 MHz (n20) – 16.50 dB, 2450 MHz (n40) – 16.50 dB, 5250 MHz (a) – 16.00 dB, 5250 MHz (n20) – 16.00 dB, 5250 MHz (n40) – 15.50 dB, 5250 MHz (ac) – 11.00 dB, 5600 MHz (a) – 16.50 dB, 5600 MHz (n20) – 16.50 dB, 5600 MHz (n40) – 16.50 dB, 5600 MHz (ac) – 16.50 dB, 5800 MHz (a) – 16.50 dB, 5800 MHz (n20) – 16.50 dB, 5800 MHz (n40) – 16.50 dB 5800 MHz (ac) – 14.00 dB Conducted
Signal Modulation:	DSSS, OFDM
Antenna Type:	Skycross Electronics (Shenzhen) Co., Ltd., PIFA Antenna
Application Type:	Certification
FCC Rule Parts:	Part 2, 15C, 15E
KDB Test Methodology:	KDB 447498 D01 v05, KDB 248227 v01r02, KDB 616217 D04 v01
Industry Canada:	RSS-102, Safety Code 6
Maximum SAR Value:	0.757 W/kg
Separation Distance:	8 mm

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, IEC 62209-2 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

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1. Introduction

This measurement report shows compliance of the Intel Corporation Model 7260NGW FCC ID: PD97260NG & PD97260NGU with FCC Part 2, 1093, ET Docket 93-62 Rules for mobile and portable devices and IC Certificate: 1000M-7260NG with RSS102 & Safety Code 6. 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 Intel Corporation Model 7260NGW and therefore apply only to the tested sample.

The module is sold under two different FCC/IC ID numbers. The ID's ending in "U" are intended to allow user install conditions and host systems must be provided with a BIOS locking feature that prevents installation of unauthorized devices.

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 7260NGW wireless modem. The table also shows the tolerance for the power level for each mode.

Band	Technology	Class	3GPP Nominal Power dBm	Setpoint Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
WLAN – 2.4 GHz	802.11b	N/A	N/A	14	±1.5	12.5	15.5
WLAN – 2.4 GHz	802.11g/n(Ch. 1 and 11)	N/A	N/A	12	±1.5	10.5	13.5
WLAN – 2.4 GHz	802.11 g/n(Ch. 2-10	N/A	N/A	15	±1.5	13.5	16.5
WLAN – 5 GHz	802.11a	N/A	N/A	13	±1.5	11.5	14.5
WLAN – 5 GHz	802.11n	N/A	N/A	15	±1.5	13.5	16.5

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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)

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2. SAR Measurement Setup

Robotic System

The measurements are conducted utilizing the ALSAS-10-U automated dosimetric assessment system. The ALSAS-10-U is designed and manufactured by Aprel Laboratories in Nepean, Ontario, Canada. The system utilizes a Robcomm 3 robot manufactured by ThermoCRS located in Michigan USA.

System Hardware

The system consists of a six axis articulated arm, controller for precise probe positioning (0.05 mm repeatability), a power supply, a teach pendent for teaching area scans, near field probe, an IBM Pentium 4™ 2.66 GHz PC with Windows XP Pro™, and custom software developed to enable communications between the robot controller software and the host operating system.

An amplifier is located on the articulated arm, which is isolated from the custom designed end effector and robot arm. The end effector provides the mechanical touch detection functionality and probe connection interface. The amplifier is functionally validated within the manufacturer's site and calibrated at NCL Calibration Laboratories. A Data Acquisition Card (DAC) is used to collect the signal as detected by the isotropic e-field probe. The DAC manufacturer calibrates the DAC to NIST standards. A formal validation is executed using all mechanical and electronic components to prove conformity of the measurement platform as a whole.

System Description

The ALSAS-10-U has been designed to measure devices within the compliance environment to meet all recognized standards. The system also conforms to standards, which are currently being developed by the scientific and manufacturing community.

The course scan resolution is defined by the operator and reflects the requirements of the standard to which the device is being tested. Precise measurements are made within the predefined course scan area and the values are logged.

The user predefines the sample rate for which the measurements are made so as to ensure that the full duty-cycle of a pulse modulation device is covered during the sample. The following algorithm is an example of the function used by the system for linearization of the output for the probe.

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

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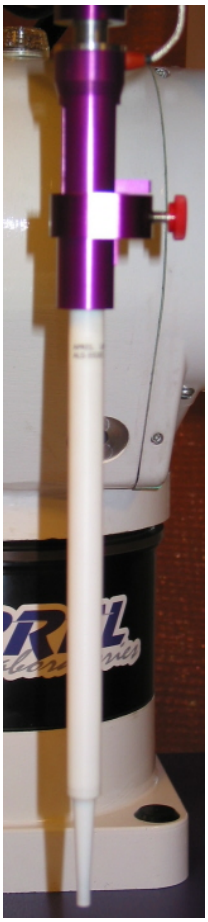

The Aprel E-Field probe is evaluated to establish the diode compression point.

A complex algorithm is then used to calculate the values within the measured points down to a resolution of 1mm. The data from this process is then used to provide the co-ordinates from which the cube scan is created for the determination of the 1 g and 10 g averages.

Cube scan averaging consists of a number of complex algorithms, which are used to calculate the one, and ten gram averages. The basis for the cube scan process is centered on the location where the maximum measured SAR value was found. When a secondary peak value is found which is within 60% of the initial peak value, the system will report this back to the operator who can then assess the need for further analysis of both the peak values prior to the one and ten-gram cube scan averaging process. The algorithm consists of 3D cubic Spline, and Lagrange extrapolation to the surface, which form the matrix for calculating the measurement output for the one and ten gram average values. The resolution for the physical scan integral is user defined with a final calculated resolution down to 1mm.

In-depth analysis for the differential of the physical scanning resolution for the cube scan analysis has been carried out, to identify the optimum setting for the probe positioning steps, and this has been determined at 8mm increments on the X, & Y planes. The reduction of the physical step increment increased the time taken for analysis but did not provide a better uncertainty or return on measured values.

The final output from the system provides data for the area scan measurements, physical and splined (1mm resolution) cube scan with physical and calculated values (1mm resolution).

The overall uncertainty for the methodology and algorithms the ALSAS-10-U used during the SAR calculation was evaluated using the data from IEEE 1528 f3 algorithm:

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

The probe used during the measurement process has been assessed to provide values for diode compression. These values are calculated during the probe calibration exercise and are used in the mathematical calculations for the assessment of SAR.

E-Field Probe

The E-field probe used by RF Exposure Lab, LLC, has been fully calibrated and assessed for isotropic, and boundary effect. The probe utilizes a triangular sensor arrangement as detailed in the diagram below right.

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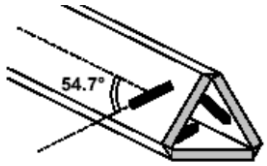
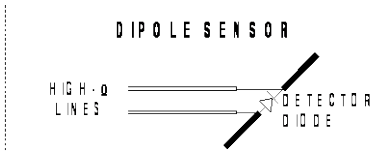


Δ-BEAM



The SAR is assessed with the probe which moves at a default height of 4mm from the center of the diode, which is mounted to the sensor, to the phantom surface (Z height). The diagram above right shows how the center of the sensor is defined with the location of the diode placed at the center of the dipole. The 4mm default in the Z axis is the optimum height for assessing SAR where the boundary effect is at its least, with the probe located closest to the phantom surface (boundary).

The manufacturer specified precision of the robot is ± 0.05 mm and the precision of the APREL bottom detection device is ± 0.1 mm. These precisions are calibrated and tested in the manufacturing process of the bottom detection device. A constant distance is maintained because the surface of the phantom is dynamically detected for each point. The surface detection algorithm corrects the position of the robot so that the probe rests on the surface of the phantom. The probe is then moved to the measurement location 2.44 mm above the phantom surface resulting in the probe center location to be at 4.0 mm above the phantom surface. Therefore, the probe sensor will be at 4.0 mm above the phantom surface ± 0.1 mm for each SAR location for frequencies below 3 GHz. The probe is moved to the measurement location 1.44 mm above the phantom surface resulting in the probe center location to be at 2.0 mm above the phantom surface. Therefore, the probe sensor will be at 2.0 mm above the phantom surface ± 0.1 mm for each SAR location for frequencies above 3 GHz.

The probe boundary effect compensation cannot be disabled in the ALSAS-10U testing system. The probe tip will always be at least half a probe tip diameter from the phantom surface. For frequencies up to 3 GHz, the probe diameter is 5 mm. With the sensor offset set at 1.54 mm (default setting), the sensor to phantom gap will be 4.0 mm which is greater than half the probe tip diameter. For frequencies greater than 3 GHz, the probe diameter is 3 mm. With the sensor offset set at 0.56 mm (default setting), the sensor to phantom gap will be 3.0 mm which is greater than half the probe tip diameter.

The separation of the first 2 measurement points in the zoom scan is specified in the test setup software. For frequencies below 3 GHz, the user must specify a zoom scan resolution of less than 6 mm in the z-axis to have the first two measurements within 1 cm of the surface. The z-axis is set to 4 mm as shown on each of the data sheets in Appendix B. For frequencies above 3 GHz, the user must specify a zoom scan resolution of less than 3 mm in the z-axis to have the first two measurements within 5 mm of the surface. The z-axis is set to 2 mm as shown on each of the data sheets in Appendix B.

The zoom scan volume for devices ≤3 GHz with a cube scan of 5x5x8 yields a volume of 32x32x28 mm^3. For devices >3 GHz and <4.5 GHz, the cube scan of 9x9x9 yields a volume of 32x32x24 mm^3. For devices ≥4.5 GHz, the cube scan of 7x7x12 yields a volume of 24x24x22 mm^3.

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3. Robot Specifications

Specifications

Positioner:	ThermoCRS, Robot Model: Robocomm 3
Repeatability:	0.05 mm
No. of axis:	6

Data Acquisition Card (DAC) System

Cell Controller

Processor:	Pentium 4™
Clock Speed:	2.66 GHz
Operating System:	Windows XP Pro™

Data Converter

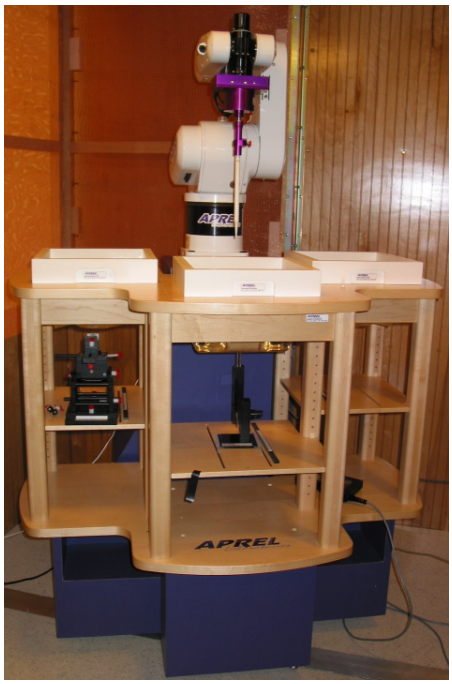
Features:	Signal Amplifier, End Effector, DAC
Software:	ALSAS 10-U Software

E-Field Probe

Model:	Various See Probe Calibration Sheet
Serial Number:	Various See Probe Calibration Sheet
Construction:	Triangular Core Touch Detection System
Frequency:	10MHz to 6GHz

Phantom

Phantom:	Uniphantom, Right Phantom, Left Phantom



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4. Probe and Dipole Calibration

See Appendix D and E.

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5. 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 5.1 Typical Composition of Ingredients for Tissue

Ingredients		Simulating Tissue			
		2450 MHz Body	5250 MHz Body	5600 MHz Body	5785 MHz Body
Mixing Percentage					
Water		73.20	Proprietary Mixture		
Sugar		0.00			
Salt		0.04			
HEC		0.00			
Bactericide		0.00			
DGBE		26.70			
Dielectric Constant	Target	52.70	48.96	48.47	48.25
Conductivity (S/m)	Target	1.95	5.35	5.77	5.96

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6. 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 6.1 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.

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7. Measurement Uncertainty

Exposure Assessment Measurement Uncertainty

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	c_i^1 (1-g)	c_i^1 (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %	v_i
Measurement System								
Probe Calibration	3.5	normal	1	1	1	3.5	3.5	∞
Axial Isotropy	3.7	rectangular	√3	0.7	0.7	1.5	1.5	∞
Hemispherical Isotropy	10.9	rectangular	√3	0.7	0.7	4.4	4.4	∞
Boundary Effect	1.0	rectangular	√3	1	1	0.6	0.6	∞
Linearity	4.7	rectangular	√3	1	1	2.7	2.7	∞
Detection Limit	1.0	rectangular	√3	1	1	0.6	0.6	∞
Readout Electronics	1.0	normal	1	1	1	1.0	1.0	∞
Response Time	0.8	rectangular	√3	1	1	0.5	0.5	∞
Integration Time	1.7	rectangular	√3	1	1	1.0	1.0	∞
RF Ambient Condition	3.0	rectangular	√3	1	1	1.7	1.7	∞
Probe Positioner Mech. Restriction	0.4	rectangular	√3	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	2.9	rectangular	√3	1	1	1.7	1.7	∞
Extrapolation and Integration	3.7	rectangular	√3	1	1	2.1	2.1	∞
Test Sample Positioning	4.0	normal	1	1	1	4.0	4.0	7
Device Holder Uncertainty	2.0	normal	1	1	1	2.0	2.0	2
Drift of Output Power	4.2	rectangular	√3	1	1	2.4	2.4	∞
Phantom and Setup								
Phantom Uncertainty(shape & thickness tolerance)	3.4	rectangular	√3	1	1	2.0	2.0	∞
Liquid Conductivity(target)	5.0	rectangular	√3	0.7	0.5	2.0	1.4	∞
Liquid Conductivity(meas.)	0.5	normal	1	0.7	0.5	0.4	0.3	5
Liquid Permittivity(target)	5.0	rectangular	√3	0.6	0.5	1.7	1.4	∞
Liquid Permittivity(meas.)	1.0	normal	1	0.6	0.5	0.6	0.5	5
Combined Uncertainty		RSS				9.6	9.4	>500
Combined Uncertainty (coverage factor=2)		Normal(k=2)				19.1	18.8	>500

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8. System Validation

Tissue Verification

Table 8.1 Measured Tissue Parameters

		2450 MHz Body		5250 MHz Body	
Date(s)		Feb. 1, 2013		Jan. 25, 2013	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured
Dielectric Constant: ε		52.70	52.51	48.95	49.18
Conductivity: σ		1.95	1.98	5.36	5.395
		5600 MHz Body		5800 MHz Body	
Date(s)		Jan. 28, 2013		Jan. 31, 2013	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured
Dielectric Constant: ε		48.47	48.44	48.20	48.15
Conductivity: σ		5.77	5.81	6.00	6.04
		5200 MHz Body		5600 MHz Body	
Date(s)		Feb. 11, 2013		Feb. 11, 2013	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured
Dielectric Constant: ε		48.95	49.36	48.47	48.81
Conductivity: σ		5.36	5.42	5.77	5.89
		5800 MHz Body			
Date(s)		Feb. 11, 2013			
Liquid Temperature (˚C)	20.0	Target	Measured		
Dielectric Constant: ε		48.20	48.50		
Conductivity: σ		6.00	6.14		

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 8.2 System Dipole Validation Target & Measured

	Test Frequency	Targeted SAR_{1g} (W/kg)	Measure SAR_{1g} (W/kg)	Tissue Used for Verification	Deviation Target and Fast SAR to SAR (%)	Plot Number
01-Feb-2013	2450 MHz	51.50	51.30	Body	- 0.39	1
25-Jan-2013	5250 MHz	73.40	71.21	Body	- 2.98	2
28-Jan-2013	5600 MHz	79.10	79.24	Body	+ 0.18	3
31-Jan-2013	5800 MHz	72.90	72.59	Body	- 0.43	4
11-Feb-2013	5250 MHz	73.40	73.26	Body	- 0.19	5
11-Feb-2013	5600 MHz	79.10	78.64	Body	- 0.58	6
11-Feb-2013	5800 MHz	72.90	70.73	Body	- 2.98	7

See Appendix A for data plots.

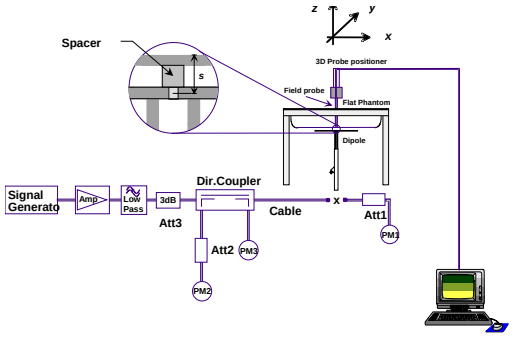

Figure 8.1 Dipole Validation Test Setup

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9. 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 EUT was installed into a laptop computer. The laptop computer was used to configure the EUT to continuously transmit at a maximum output power on the channel specified in the test data.

The data rates used when evaluating the WiFi transmitter were the lowest data rates for each mode. The device was operating at its maximum output power at the lowest data rate for all measurements.

Bluetooth operation was not evaluated as the power level of the BT transmitter was less than 10 mW per KDB 447498 Appendix A. The Bluetooth transmitter does simultaneously transmit with the WiFi transmitter. When the BT is turned on, it transmits on Chain 1 and the WiFi transmits on Chain 2. The installation guide has instructions to the installer to set the two antennas with a minimum of 50 mm separation. Simultaneous transmission is evaluated on page 33.

The PC was using the Intel test utility DRTU Version 1.6.1-548 and the device driver was version 16.0.0.18.

The EUT antenna is a two-antenna PIFA antenna system – Shanghai Universe Communication Electron Co., Ltd. The antenna connects to the EUT via a non-standard antenna connector.

The antenna was tested on all six sides of the antenna device. During each test, the antenna was on a minimum of 10 cm of Styrofoam during the test. The coaxial cable from the module to the antenna was 500 mm in length. The laptop was set to be >10 cm from the antenna during the test. The following is a pictorial drawing of the locations.

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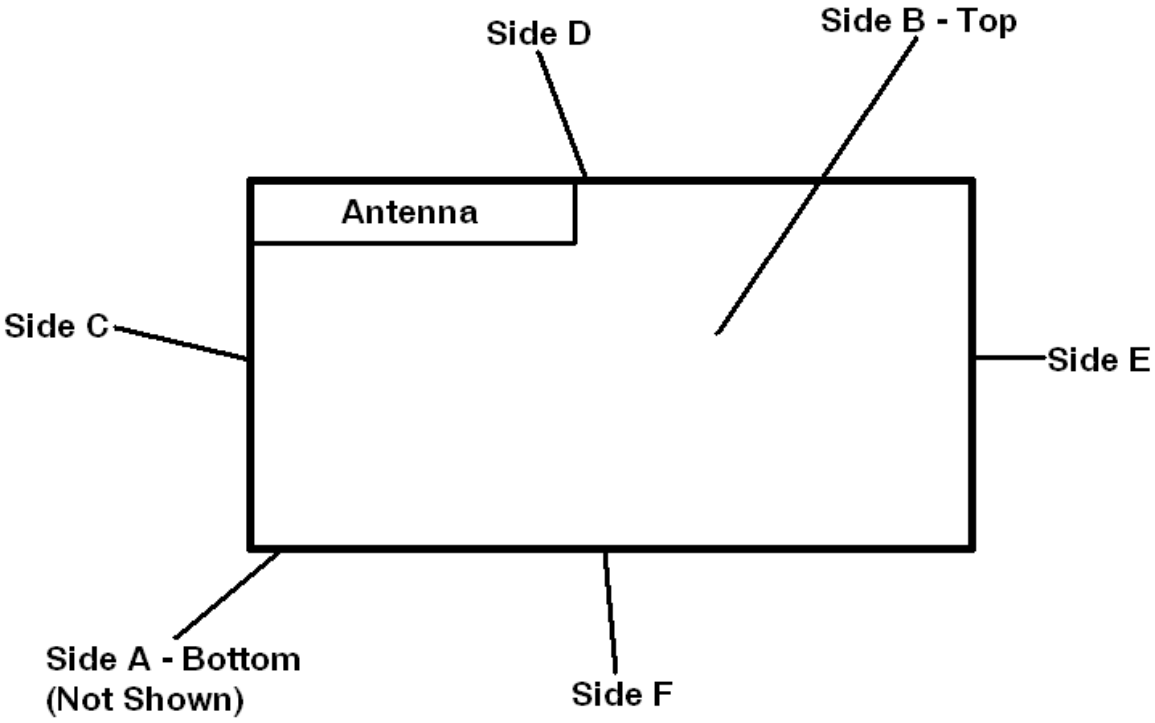
SAR Location Diagram



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Band	Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	Data Rate	Antenna	Power (dBm)
2450 MHz	802.11b	20	1	2412	1 Mbps	Chain 1	15.47
			6	2437			15.50
			11	2462			15.48
			1	2412		Chain 2	13.98
			6	2437			14.00
			11	2462			13.99
	802.11g	20	1	2412	6 Mbps	Chain 1	13.48
			6	2437			16.50
			11	2462			13.47
			1	2412		Chain 2	11.99
			6	2437			15.49
			11	2462			13.46
	802.11n	20	1	2412	HT4	Chain 1	13.48
			6	2437			16.50
			11	2462			13.46
			1	2412		Chain 2	11.97
			6	2437			15.50
			11	2462			13.42
	802.11n	40	3	2422	HT4	Chain 1	11.96
			6	2437			16.47
			9	2452			12.90
			3	2422		Chain 2	9.92
			6	2437			13.42
			9	2452			12.89
5.15-5.25 GHz	802.11a	20	36	5180	6 Mbps	Chain 1	13.46
			40	5200			15.86
			44	5220			16.00
			48	5240			14.98
			36	5180		Chain 2	12.89
			40	5200			15.92
			44	5220			16.00
			48	5240			14.96
	802.11n	20	36	5180	HT4	Chain 1	13.42
			40	5200			15.87
			44	5220			16.00
			48	5240			15.48
			36	5180		Chain 2	12.86
			40	5200			15.91
			44	5220			16.00
			48	5240			15.46
	802.11n	40	38	5190	HT4	Chain 1	9.46
			46	5230			15.42
			38	5190	HT4	Chain 2	9.94
			46	5230			15.37
	802.11ac	80	42	5210	VHT6	Chain 1	8.46
						Chain 2	8.39
5.25-5.35 GHz	802.11a	20	52	5260	6 Mbps	Chain 1	13.45
			56	5280			15.87
			60	5300			16.00
			64	5320			13.46
			52	5260		Chain 2	12.90
			56	5280			15.93
			60	5300			16.00
			64	5320			12.94
	802.11n	20	52	5260	HT4	Chain 1	13.42
			56	5280			15.81
			60	5300			15.94
			64	5320			13.48
			52	5260		Chain 2	12.85
			56	5280			15.93
			60	5300			15.85
			64	5320			13.00
	802.11n	40	54	5270	HT4	Chain 1	9.48
			62	5310			11.00
			54	5270	HT4	Chain 2	9.99
			62	5310			10.97
	802.11ac	80	58	5290	VHT6	Chain 1	10.47
						Chain 2	10.92

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Band	Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	Data Rate	Antenna	Power (dBm)
5600 MHz	802.11a	20	100	5500	6 Mbps	Chain 1	13.46
			104	5520			16.42
			108	5540			16.39
			112	5560			16.50
			116	5580			16.48
			120	5600			16.42
			124	5620			16.46
			128	5640			16.37
			132	5660			16.50
			136	5680			16.47
			140	5700			12.93
			100	5500		Chain 2	12.95
			104	5520			16.42
			108	5540			16.38
			112	5560			16.50
			116	5580			16.43
			120	5600			16.48
			124	5620			16.42
			128	5640			16.40
			132	5660			16.50
			136	5680			16.38
			140	5700			12.42
	802.11n	20	100	5500	HT4	Chain 1	13.50
			104	5520			16.42
			108	5540			16.48
			112	5560			16.45
			116	5580			16.37
			120	5600			16.48
			124	5620			16.50
			128	5640			16.41
			132	5660			16.45
			136	5680			16.39
			140	5700			12.98
			100	5500		Chain 2	12.99
			104	5520			16.34
			108	5540			16.39
			112	5560			16.41
			116	5580			16.50
			120	5600			16.42
			124	5620			16.48
			128	5640			16.43
			132	5660			16.47
			136	5680			16.48
			140	5700			12.49
	802.11n	40	102	5510	HT4	Chain 1	10.42
			110	5550			16.48
			118	5580			16.42
			126	5610			16.47
			134	5670			15.49
			102	5510	HT4	Chain 2	10.48
			110	5550			16.48
			118	5580			16.43
			126	5610			16.38
			134	5670			15.46
	802.11ac	20	144	5720	VHT0	Chain 1	16.48
						Chain 2	16.42
		40	142	5710		Chain 1	16.43
						Chain 2	16.47
		80	106	5530	VHT6	Chain 1	8.97
			122	5610			13.95
			138	5690			13.92
			106	5530		Chain 2	8.91
			122	5610			13.97
			138	5690			13.99

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Band	Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	Data Rate	Antenna	Power (dBm)
5800 MHz	802.11a	20	149	5745	6 Mbps	Chain 1	16.48
			153	5765			16.47
			157	5785			16.50
			161	5805			16.43
			165	5825			16.38
			149	5745		Chain 2	16.42
			153	5765			16.45
			157	5785			16.50
			161	5805			16.47
			165	5825			16.49
	802.11n	20	149	5745	HT8	Chain 1	16.42
			153	5765			16.45
			157	5785			16.48
			161	5805			16.43
			165	5825			16.41
			149	5745		Chain 2	16.40
			153	5765			16.48
			157	5785			16.39
			161	5805			16.47
			165	5825			16.45
	802.11n	40	151	5755	HT8	Chain 1	16.43
			159	5795			16.37
			151	5755		Chain 2	16.36
			159	5795			16.42
	802.11ac	80	155	5775	VHT6	Chain 1	13.98
						Chain 2	14.00

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Figure 8.1 Test Reduction Table – WiFi

Mode	Side	Required Channel	Tested/Reduced
802.11b	Side A	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Side B	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Side C	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Side D	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Side E	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Side F	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
802.11g	Side A	1 – 2412 MHz	Reduced[1]
		6 – 2437 MHz	Tested
		11 – 2462 MHz	Reduced[1]
	Side B	1 – 2412 MHz	Reduced[1]
		6 – 2437 MHz	Tested
		11 – 2462 MHz	Reduced[1]
	Side C	1 – 2412 MHz	Reduced[1]
		6 – 2437 MHz	Tested
		11 – 2462 MHz	Reduced[1]
	Side D	1 – 2412 MHz	Reduced[1]
		6 – 2437 MHz	Tested
		11 – 2462 MHz	Reduced[1]
	Side E	1 – 2412 MHz	Reduced[1]
		6 – 2437 MHz	Tested
		11 – 2462 MHz	Reduced[1]
	Side F	1 – 2412 MHz	Reduced[1]
		6 – 2437 MHz	Tested
		11 – 2462 MHz	Reduced[1]
802.11n	Side A	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Side B	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Side C	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Side D	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Side E	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]
	Side F	1 – 2412 MHz	Reduced[2]
		6 – 2437 MHz	Reduced[2]
		11 – 2462 MHz	Reduced[2]

Both Chains 1 and 2 were tested per these test reduction requirements.

Reduced[1] – When the mid channel is 3 dB below the limit, the remaining channels are not required per KDB 447498 D01 v05 section 4.3.3 page 13.

Reduced[2] – When the conducted power in this mode is less than 0.25 dB higher than the g mode, testing is not required per KDB 248227 page 5.

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Mode	Side	Required Channel	Tested/Reduced
802.11a 5150 MHz	Side A	36 – 5180 MHz	Reduced[1]
		40 – 5200 MHz	Reduced[1]
		44 – 5220 MHz	Tested
		48 – 5240 MHz	Reduced[1]
	Side B	36 – 5180 MHz	Reduced[1]
		40 – 5200 MHz	Reduced[1]
		44 – 5220 MHz	Tested
		48 – 5240 MHz	Reduced[1]
	Side C	36 – 5180 MHz	Reduced[1]
		40 – 5200 MHz	Reduced[1]
		44 – 5220 MHz	Tested
		48 – 5240 MHz	Reduced[1]
	Side D	36 – 5180 MHz	Reduced[1]
		40 – 5200 MHz	Reduced[1]
		44 – 5220 MHz	Tested
		48 – 5240 MHz	Reduced[1]
	Side E	36 – 5180 MHz	Reduced[1]
		40 – 5200 MHz	Reduced[1]
		44 – 5220 MHz	Tested
		48 – 5240 MHz	Reduced[1]
	Side F	36 – 5180 MHz	Reduced[1]
		40 – 5200 MHz	Reduced[1]
		44 – 5220 MHz	Tested
		48 – 5240 MHz	Reduced[1]
802.11n 5150 MHz	Side A	36 – 5180 MHz	Reduced[2]
		40 – 5200 MHz	Reduced[2]
		44 – 5220 MHz	Reduced[2]
		48 – 5240 MHz	Reduced[2]
	Side B	36 – 5180 MHz	Reduced[2]
		40 – 5200 MHz	Reduced[2]
		44 – 5220 MHz	Reduced[2]
		48 – 5240 MHz	Reduced[2]
	Side C	36 – 5180 MHz	Reduced[2]
		40 – 5200 MHz	Reduced[2]
		44 – 5220 MHz	Reduced[2]
		48 – 5240 MHz	Reduced[2]
	Side D	36 – 5180 MHz	Reduced[2]
		40 – 5200 MHz	Reduced[2]
		44 – 5220 MHz	Reduced[2]
		48 – 5240 MHz	Reduced[2]
	Side E	36 – 5180 MHz	Reduced[2]
		40 – 5200 MHz	Reduced[2]
		44 – 5220 MHz	Reduced[2]
		48 – 5240 MHz	Reduced[2]
	Side F	36 – 5180 MHz	Reduced[2]
		40 – 5200 MHz	Reduced[2]
		44 – 5220 MHz	Reduced[2]
		48 – 5240 MHz	Reduced[2]
802.11ac 5210 MHz	Side A	42 – 5210 MHz	Reduced[2]
	Side B	42 – 5210 MHz	Reduced[2]
	Side C	42 – 5210 MHz	Tested
	Side D	42 – 5210 MHz	Reduced[2]
	Side E	42 – 5210 MHz	Reduced[2]
	Side F	42 – 5210 MHz	Reduced[2]

Both Chains 1 and 2 were tested per these test reduction requirements.

Reduced[1] – When the highest conducted power channel is 3 dB below the limit, the remaining channels are not required per KDB 447498 D01 v05 section 4.3.3 page 13.

Reduced[2] – When the conducted power in this mode is less than 0.25 dB higher than the a mode, testing is not required per KDB 248227 page 5 and KDB Inquiry 448433.

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Mode	Side	Required Channel	Tested/Reduced
802.11a 5250 MHz	Side A	52 – 5260 MHz	Reduced[1]
		56 – 5280 MHz	Reduced[1]
		60 – 5300 MHz	Tested
		64 – 5320 MHz	Reduced[1]
	Side B	52 – 5260 MHz	Reduced[1]
		56 – 5280 MHz	Reduced[1]
		60 – 5300 MHz	Tested
		64 – 5320 MHz	Reduced[1]
	Side C	52 – 5260 MHz	Reduced[1]
		56 – 5280 MHz	Reduced[1]
		60 – 5300 MHz	Tested
		64 – 5320 MHz	Reduced[1]
	Side D	52 – 5260 MHz	Reduced[1]
		56 – 5280 MHz	Reduced[1]
		60 – 5300 MHz	Tested
		64 – 5320 MHz	Reduced[1]
	Side E	52 – 5260 MHz	Reduced[1]
		56 – 5280 MHz	Reduced[1]
		60 – 5300 MHz	Tested
		64 – 5320 MHz	Reduced[1]
	Side F	52 – 5260 MHz	Reduced[1]
		56 – 5280 MHz	Reduced[1]
		60 – 5300 MHz	Tested
		64 – 5320 MHz	Reduced[1]
802.11n 5250 MHz	Side A	52 – 5260 MHz	Reduced[2]
		56 – 5280 MHz	Reduced[2]
		60 – 5300 MHz	Reduced[2]
		64 – 5320 MHz	Reduced[2]
	Side B	52 – 5260 MHz	Reduced[2]
		56 – 5280 MHz	Reduced[2]
		60 – 5300 MHz	Reduced[2]
		64 – 5320 MHz	Reduced[2]
	Side C	52 – 5260 MHz	Reduced[2]
		56 – 5280 MHz	Reduced[2]
		60 – 5300 MHz	Reduced[2]
		64 – 5320 MHz	Reduced[2]
	Side D	52 – 5260 MHz	Reduced[2]
		56 – 5280 MHz	Reduced[2]
		60 – 5300 MHz	Reduced[2]
		64 – 5320 MHz	Reduced[2]
	Side E	52 – 5260 MHz	Reduced[2]
		56 – 5280 MHz	Reduced[2]
		60 – 5300 MHz	Reduced[2]
		64 – 5320 MHz	Reduced[2]
	Side F	52 – 5260 MHz	Reduced[2]
		56 – 5280 MHz	Reduced[2]
		60 – 5300 MHz	Reduced[2]
		64 – 5320 MHz	Reduced[2]
802.11ac 5290 MHz	Side A	58 – 5290 MHz	Reduced[2]
	Side B	58 – 5290 MHz	Reduced[2]
	Side C	58 – 5290 MHz	Tested
	Side D	58 – 5290 MHz	Reduced[2]
	Side E	58 – 5290 MHz	Reduced[2]
	Side F	58 – 5290 MHz	Reduced[2]

Both Chains 1 and 2 were tested per these test reduction requirements.

Reduced[1] – When the highest conducted power channel is 3 dB below the limit, the remaining channels are not required per KDB 447498 D01 v05 section 4.3.3 page 13.

Reduced[2] – When the conducted power in this mode is less than 0.25 dB higher than the a mode, testing is not required per KDB 248227 page 5 and KDB Inquiry 448433.

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

Mode	Side	Required Channel	Tested/Reduced
802.11a 5600 MHz	Side A	100 – 5500 MHz	Reduced[1]
		104 – 5520 MHz	Reduced[1]
		108 – 5540 MHz	Reduced[1]
		112 – 5560 MHz	Tested
		116 – 5580 MHz	Reduced[1]
		120 – 5600 MHz	Reduced[1]
		124 – 5620 MHz	Reduced[1]
		128 – 5640 MHz	Reduced[1]
		132 – 5660 MHz	Tested
		136 – 5680 MHz	Reduced[1]
		140 – 5700 MHz	Reduced[1]
	Side B	100 – 5500 MHz	Reduced[1]
		104 – 5520 MHz	Reduced[1]
		108 – 5540 MHz	Reduced[1]
		112 – 5560 MHz	Tested
		116 – 5580 MHz	Reduced[1]
		120 – 5600 MHz	Reduced[1]
		124 – 5620 MHz	Reduced[1]
		128 – 5640 MHz	Reduced[1]
		132 – 5660 MHz	Tested
		136 – 5680 MHz	Reduced[1]
		140 – 5700 MHz	Reduced[1]
	Side C	100 – 5500 MHz	Reduced[1]
		104 – 5520 MHz	Reduced[1]
		108 – 5540 MHz	Reduced[1]
		112 – 5560 MHz	Tested
		116 – 5580 MHz	Reduced[1]
		120 – 5600 MHz	Reduced[1]
		124 – 5620 MHz	Reduced[1]
		128 – 5640 MHz	Reduced[1]
		132 – 5660 MHz	Tested
		136 – 5680 MHz	Reduced[1]
		140 – 5700 MHz	Reduced[1]
	Side D	100 – 5500 MHz	Reduced[1]
		104 – 5520 MHz	Reduced[1]
		108 – 5540 MHz	Reduced[1]
		112 – 5560 MHz	Tested
		116 – 5580 MHz	Reduced[1]
		120 – 5600 MHz	Reduced[1]
		124 – 5620 MHz	Reduced[1]
		128 – 5640 MHz	Reduced[1]
		132 – 5660 MHz	Tested
		136 – 5680 MHz	Reduced[1]
		140 – 5700 MHz	Reduced[1]
	Side E	100 – 5500 MHz	Reduced[1]
		104 – 5520 MHz	Reduced[1]
		108 – 5540 MHz	Reduced[1]
		112 – 5560 MHz	Tested
		116 – 5580 MHz	Reduced[1]
		120 – 5600 MHz	Reduced[1]
		124 – 5620 MHz	Reduced[1]
		128 – 5640 MHz	Reduced[1]
		132 – 5660 MHz	Tested
		136 – 5680 MHz	Reduced[1]
		140 – 5700 MHz	Reduced[1]
	Side F	100 – 5500 MHz	Reduced[1]
		104 – 5520 MHz	Reduced[1]
		108 – 5540 MHz	Reduced[1]
		112 – 5560 MHz	Tested
		116 – 5580 MHz	Reduced[1]
		120 – 5600 MHz	Reduced[1]
		124 – 5620 MHz	Reduced[1]
		128 – 5640 MHz	Reduced[1]
		132 – 5660 MHz	Tested
		136 – 5680 MHz	Reduced[1]
		140 – 5700 MHz	Reduced[1]

Both Chains 1 and 2 were tested per these test reduction requirements.

Reduced[1] – When the highest conducted power channel is 3 dB below the limit, the remaining channels are not required per KDB 447498 D01 v05 section 4.3.3 page 13.

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Mode	Side	Required Channel	Tested/Reduced
802.11n 5600 MHz	Side A	100 – 5500 MHz	Reduced[2]
		104 – 5520 MHz	Reduced[2]
		108 – 5540 MHz	Reduced[2]
		112 – 5560 MHz	Reduced[2]
		116 – 5580 MHz	Reduced[2]
		120 – 5600 MHz	Reduced[2]
		124 – 5620 MHz	Reduced[2]
		128 – 5640 MHz	Reduced[2]
		132 – 5660 MHz	Reduced[2]
		136 – 5680 MHz	Reduced[2]
		140 – 5700 MHz	Reduced[2]
	Side B	100 – 5500 MHz	Reduced[2]
		104 – 5520 MHz	Reduced[2]
		108 – 5540 MHz	Reduced[2]
		112 – 5560 MHz	Reduced[2]
		116 – 5580 MHz	Reduced[2]
		120 – 5600 MHz	Reduced[2]
		124 – 5620 MHz	Reduced[2]
		128 – 5640 MHz	Reduced[2]
		132 – 5660 MHz	Reduced[2]
		136 – 5680 MHz	Reduced[2]
		140 – 5700 MHz	Reduced[2]
	Side C	100 – 5500 MHz	Reduced[2]
		104 – 5520 MHz	Reduced[2]
		108 – 5540 MHz	Reduced[2]
		112 – 5560 MHz	Reduced[2]
		116 – 5580 MHz	Reduced[2]
		120 – 5600 MHz	Reduced[2]
		124 – 5620 MHz	Reduced[2]
		128 – 5640 MHz	Reduced[2]
		132 – 5660 MHz	Reduced[2]
		136 – 5680 MHz	Reduced[2]
		140 – 5700 MHz	Reduced[2]
	Side D	100 – 5500 MHz	Reduced[2]
		104 – 5520 MHz	Reduced[2]
		108 – 5540 MHz	Reduced[2]
		112 – 5560 MHz	Reduced[2]
		116 – 5580 MHz	Reduced[2]
		120 – 5600 MHz	Reduced[2]
		124 – 5620 MHz	Reduced[2]
		128 – 5640 MHz	Reduced[2]
		132 – 5660 MHz	Reduced[2]
		136 – 5680 MHz	Reduced[2]
		140 – 5700 MHz	Reduced[2]
	Side E	100 – 5500 MHz	Reduced[2]
		104 – 5520 MHz	Reduced[2]
		108 – 5540 MHz	Reduced[2]
		112 – 5560 MHz	Reduced[2]
		116 – 5580 MHz	Reduced[2]
		120 – 5600 MHz	Reduced[2]
		124 – 5620 MHz	Reduced[2]
		128 – 5640 MHz	Reduced[2]
		132 – 5660 MHz	Reduced[2]
		136 – 5680 MHz	Reduced[2]
		140 – 5700 MHz	Reduced[2]
	Side F	100 – 5500 MHz	Reduced[2]
		104 – 5520 MHz	Reduced[2]
		108 – 5540 MHz	Reduced[2]
		112 – 5560 MHz	Reduced[2]
		116 – 5580 MHz	Reduced[2]
		120 – 5600 MHz	Reduced[2]
		124 – 5620 MHz	Reduced[2]
		128 – 5640 MHz	Reduced[2]
		132 – 5660 MHz	Reduced[2]
		136 – 5680 MHz	Reduced[2]
		140 – 5700 MHz	Reduced[2]

Both Chains 1 and 2 were tested per these test reduction requirements.

Reduced[2] – When the conducted power in this mode is less than 0.25 dB higher than the a mode, testing is not required per KDB 248227 page 5 and KDB Inquiry 448433.

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

Mode	Side	Required Channel	Tested/Reduced
802.11n 5600 MHz	Side A	106 – 5530 MHz	Reduced[2]
		122 – 5610 MHz	Reduced[2]
		138 – 5690 MHz	Reduced[2]
	Side B	106 – 5530 MHz	Reduced[2]
		122 – 5610 MHz	Reduced[2]
		138 – 5690 MHz	Reduced[2]
	Side C	106 – 5530 MHz	Reduced[2]
		122 – 5610 MHz	Tested
		138 – 5690 MHz	Reduced[2]
	Side D	106 – 5530 MHz	Reduced[2]
		122 – 5610 MHz	Reduced[2]
		138 – 5690 MHz	Reduced[2]
	Side E	106 – 5530 MHz	Reduced[2]
		122 – 5610 MHz	Reduced[2]
		138 – 5690 MHz	Reduced[2]
	Side F	106 – 5530 MHz	Reduced[2]
		122 – 5610 MHz	Reduced[2]
		138 – 5690 MHz	Reduced[2]

Both Chains 1 and 2 were tested per these test reduction requirements.
Reduced[2] – When the conducted power in this mode is less than 0.25 dB higher than the a mode, testing is not required per KDB 248227 page 5 and KDB Inquiry 448433.

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Mode	Side	Required Channel	Tested/Reduced
802.11a 5800 MHz	Side A	149 – 5745 MHz	Reduced[1]
		153 – 5765 MHz	Reduced[1]
		157 – 5785 MHz	Tested
		161 – 5805 MHz	Reduced[1]
		165 – 5825 MHz	Reduced[1]
	Side B	149 – 5745 MHz	Reduced[1]
		153 – 5765 MHz	Reduced[1]
		157 – 5785 MHz	Tested
		161 – 5805 MHz	Reduced[1]
		165 – 5825 MHz	Reduced[1]
	Side C	149 – 5745 MHz	Reduced[1]
		153 – 5765 MHz	Reduced[1]
		157 – 5785 MHz	Tested
		161 – 5805 MHz	Reduced[1]
		165 – 5825 MHz	Reduced[1]
	Side D	149 – 5745 MHz	Reduced[1]
		153 – 5765 MHz	Reduced[1]
		157 – 5785 MHz	Tested
		161 – 5805 MHz	Reduced[1]
		165 – 5825 MHz	Reduced[1]
	Side E	149 – 5745 MHz	Reduced[1]
		153 – 5765 MHz	Reduced[1]
		157 – 5785 MHz	Tested
		161 – 5805 MHz	Reduced[1]
		165 – 5825 MHz	Reduced[1]
	Side F	149 – 5745 MHz	Reduced[1]
		153 – 5765 MHz	Reduced[1]
		157 – 5785 MHz	Tested
		161 – 5805 MHz	Reduced[1]
		165 – 5825 MHz	Reduced[1]
802.11n 5800 MHz	Side A	149 – 5745 MHz	Reduced[2]
		153 – 5765 MHz	Reduced[2]
		157 – 5785 MHz	Reduced[2]
		161 – 5805 MHz	Reduced[2]
		165 – 5825 MHz	Reduced[2]
	Side B	149 – 5745 MHz	Reduced[2]
		153 – 5765 MHz	Reduced[2]
		157 – 5785 MHz	Reduced[2]
		161 – 5805 MHz	Reduced[2]
		165 – 5825 MHz	Reduced[2]
	Side C	149 – 5745 MHz	Reduced[2]
		153 – 5765 MHz	Reduced[2]
		157 – 5785 MHz	Reduced[2]
		161 – 5805 MHz	Reduced[2]
		165 – 5825 MHz	Reduced[2]
	Side D	149 – 5745 MHz	Reduced[2]
		153 – 5765 MHz	Reduced[2]
		157 – 5785 MHz	Reduced[2]
		161 – 5805 MHz	Reduced[2]
		165 – 5825 MHz	Reduced[2]
	Side E	149 – 5745 MHz	Reduced[2]
		153 – 5765 MHz	Reduced[2]
		157 – 5785 MHz	Reduced[2]
		161 – 5805 MHz	Reduced[2]
		165 – 5825 MHz	Reduced[2]
	Side F	149 – 5745 MHz	Reduced[2]
		153 – 5765 MHz	Reduced[2]
		157 – 5785 MHz	Reduced[2]
		161 – 5805 MHz	Reduced[2]
		165 – 5825 MHz	Reduced[2]
802.11ac 5775 MHz	Side A	155 – 5775 MHz	Reduced[2]
	Side B	155 – 5775 MHz	Reduced[2]
	Side C	155 – 5775 MHz	Tested
	Side D	155 – 5775 MHz	Reduced[2]
	Side E	155 – 5775 MHz	Reduced[2]
	Side F	155 – 5775 MHz	Reduced[2]

Both Chains 1 and 2 were tested per these test reduction requirements.

Reduced[1] – When the highest conducted power channel is 3 dB below the limit, the remaining channels are not required per KDB 447498 D01 v05 section 4.3.3 page 13.

Reduced[2] – When the conducted power in this mode is less than 0.25 dB higher than the a mode, testing is not required per KDB 248227 page 5 and KDB Inquiry 448433.

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SAR Data Summary – 2450 MHz Body 802.11g

MEASUREMENT RESULTS								
Gap	Plot	Position	Frequency		Modulation	Antenna	End Power	SAR (W/kg)
			MHz	Ch.			(dBm)	
8 mm	-----	Side A	2437	6	OFDM	Chain 1	16.50	0.422
	-----	Side B	2437	6	OFDM	Chain 1	16.50	0.451
	-----	Side C	2437	6	OFDM	Chain 1	16.50	0.548
	-----	Side D	2437	6	OFDM	Chain 1	16.50	0.323
	-----	Side E	2437	6	OFDM	Chain 1	16.50	0.145
	-----	Side F	2437	6	OFDM	Chain 1	16.50	0.042
	-----	Side A	2437	6	OFDM	Chain 2	15.49	0.441
	-----	Side B	2437	6	OFDM	Chain 2	15.49	0.443
	1	Side C	2437	6	OFDM	Chain 2	15.49	0.550
	-----	Side D	2437	6	OFDM	Chain 2	15.49	0.314
	-----	Side E	2437	6	OFDM	Chain 2	15.49	0.143
	-----	Side F	2437	6	OFDM	Chain 2	15.49	0.044

Body
1.6 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 ☒Uniphantom ☐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

Note: SAR Tested on the Highest output power channel. See the photo in Appendix C and diagram on page 15 for a pictorial of the setup and labeling of the test locations.

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SAR Data Summary – 5150 MHz Body 802.11a

MEASUREMENT RESULTS								
Gap	Plot	Position	Frequency		Modulation	Antenna	End Power	SAR (W/kg)
			MHz	Ch.			(dBm)	
8 mm	-----	Side A	5220	44	OFDM	Chain 1	16.00	0.588
	-----	Side B	5220	44	OFDM	Chain 1	16.00	0.709
	2	Side C	5220	44	OFDM	Chain 1	16.00	0.757
	-----	Side D	5220	44	OFDM	Chain 1	16.00	0.472
	-----	Side E	5220	44	OFDM	Chain 1	16.00	0.196
	-----	Side F	5220	44	OFDM	Chain 1	16.00	0.098
	-----	Side A	5220	44	OFDM	Chain 2	16.00	0.598
	-----	Side B	5220	44	OFDM	Chain 2	16.00	0.714
	-----	Side C	5220	44	OFDM	Chain 2	16.00	0.736
	-----	Side D	5220	44	OFDM	Chain 2	16.00	0.481
	-----	Side E	5220	44	OFDM	Chain 2	16.00	0.177
	-----	Side F	5220	44	OFDM	Chain 2	16.00	0.097

Body
1.6 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 ☒Uniphantom ☐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

Note: SAR Tested on the Highest output power channel. See the photo in Appendix C and diagram on page 15 for a pictorial of the setup and labeling of the test locations.

The test was conducted on the channel in the 5250 MHz band on page 28.

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SAR Data Summary – 5250 MHz Body 802.11a

MEASUREMENT RESULTS								
Gap	Plot	Position	Frequency		Modulation	Antenna	End Power	SAR (W/kg)
			MHz	Ch.			(dBm)	
8 mm	-----	Side A	5300	60	OFDM	Chain 1	16.00	0.585
	-----	Side B	5300	60	OFDM	Chain 1	16.00	0.701
	-----	Side C	5300	60	OFDM	Chain 1	16.00	0.741
	-----	Side D	5300	60	OFDM	Chain 1	16.00	0.464
	-----	Side E	5300	60	OFDM	Chain 1	16.00	0.208
	-----	Side F	5300	60	OFDM	Chain 1	16.00	0.108
	-----	Side A	5300	60	OFDM	Chain 2	16.00	0.597
	-----	Side B	5300	60	OFDM	Chain 2	16.00	0.719
	3	Side C	5300	60	OFDM	Chain 2	16.00	0.752
	-----	Side D	5300	60	OFDM	Chain 2	16.00	0.462
	-----	Side E	5300	60	OFDM	Chain 2	16.00	0.184
	-----	Side F	5300	60	OFDM	Chain 2	16.00	0.099

Body
1.6 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 ☒Uniphantom ☐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

Note: SAR Tested on the Highest output power channel. See the photo in Appendix C and diagram on page 15 for a pictorial of the setup and labeling of the test locations.

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SAR Data Summary – 5600 MHz Low Band Body 802.11a

MEASUREMENT RESULTS								
Gap	Plot	Position	Frequency		Modulation	Antenna	End Power	SAR (W/kg)
			MHz	Ch.			(dBm)	
8 mm	-----	Side A	5560	112	OFDM	Chain 1	16.50	0.605
	-----	Side B	5560	112	OFDM	Chain 1	16.50	0.670
	-----	Side C	5560	112	OFDM	Chain 1	16.50	0.752
	-----	Side D	5560	112	OFDM	Chain 1	16.50	0.496
	-----	Side E	5560	112	OFDM	Chain 1	16.50	0.201
	-----	Side F	5560	112	OFDM	Chain 1	16.50	0.091
	-----	Side A	5560	112	OFDM	Chain 2	16.50	0.645
	-----	Side B	5560	112	OFDM	Chain 2	16.50	0.671
	4	Side C	5560	112	OFDM	Chain 2	16.50	0.756
	-----	Side D	5560	112	OFDM	Chain 2	16.50	0.496
	-----	Side E	5560	112	OFDM	Chain 2	16.50	0.208
	-----	Side F	5560	112	OFDM	Chain 2	16.50	0.103
							Body **1.6 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 ☒Uniphantom ☐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

Note: SAR Tested on the Highest output power channel. See the photo in Appendix C and diagram on page 15 for a pictorial of the setup and labeling of the test locations.

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SAR Data Summary – 5600 MHz High Band Body 802.11a

MEASUREMENT RESULTS								
Gap	Plot	Position	Frequency		Modulation	Antenna	End Power	SAR (W/kg)
			MHz	Ch.			(dBm)	
8 mm	-----	Side A	5660	132	OFDM	Chain 1	16.50	0.642
	-----	Side B	5660	132	OFDM	Chain 1	16.50	0.674
	-----	Side C	5660	132	OFDM	Chain 1	16.50	0.754
	-----	Side D	5660	132	OFDM	Chain 1	16.50	0.513
	-----	Side E	5660	132	OFDM	Chain 1	16.50	0.211
	-----	Side F	5660	132	OFDM	Chain 1	16.50	0.095
	-----	Side A	5660	132	OFDM	Chain 2	16.50	0.648
	-----	Side B	5660	132	OFDM	Chain 2	16.50	0.612
	5	Side C	5660	132	OFDM	Chain 2	16.50	0.757
	-----	Side D	5660	132	OFDM	Chain 2	16.50	0.507
	-----	Side E	5660	132	OFDM	Chain 2	16.50	0.211
	-----	Side F	5660	132	OFDM	Chain 2	16.50	0.093
							Body **1.6 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 ☒Uniphantom ☐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

Note: SAR Tested on the Highest output power channel. See the photo in Appendix C and diagram on page 15 for a pictorial of the setup and labeling of the test locations.

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SAR Data Summary – 5800 MHz Body 802.11a

MEASUREMENT RESULTS								
Gap	Plot	Position	Frequency		Modulation	Antenna	End Power	SAR (W/kg)
			MHz	Ch.			(dBm)	
8 mm	-----	Side A	5785	157	OFDM	Chain 1	16.50	0.715
	-----	Side B	5785	157	OFDM	Chain 1	16.50	0.618
	-----	Side C	5785	157	OFDM	Chain 1	16.50	0.719
	-----	Side D	5785	157	OFDM	Chain 1	16.50	0.514
	-----	Side E	5785	157	OFDM	Chain 1	16.50	0.220
	-----	Side F	5785	157	OFDM	Chain 1	16.50	0.097
	-----	Side A	5785	157	OFDM	Chain 2	16.50	0.729
	-----	Side B	5785	157	OFDM	Chain 2	16.50	0.606
	6	Side C	5785	157	OFDM	Chain 2	16.50	0.736
	-----	Side D	5785	157	OFDM	Chain 2	16.50	0.512
	-----	Side E	5785	157	OFDM	Chain 2	16.50	0.221
	-----	Side F	5785	157	OFDM	Chain 2	16.50	0.093
							Body **1.6 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 ☒Uniphantom ☐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

Note: SAR Tested on the Highest output power channel. See the photo in Appendix C and diagram on page 15 for a pictorial of the setup and labeling of the test locations.

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SAR Data Summary – 5 GHz Body 802.11ac 80 MHz Bandwidth

MEASUREMENT RESULTS								
Gap	Plot	Position	Frequency		Modulation	Antenna	End Power	SAR (W/kg)
			MHz	Ch.			(dBm)	
5 mm	-----	Side C	5210	42	OFDM	Chain 1	8.46	0.356
	-----	Side C	5290	58	OFDM	Chain 2	10.92	0.431
	-----	Side C	5610	122	OFDM	Chain 2	13.97	0.467
	-----	Side C	5775	155	OFDM	Chain 2	14.00	0.491
							Body **1.6 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 ☒Uniphantom ☐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

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Vice President

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SAR Data Summary – Simultaneous Evaluation

MEASUREMENT RESULTS								
Frequency		Modulation	Frequency		Modulation	SAR_1	SAR_2	SAR Total
MHz	Ch.		MHz	Ch.				
2437	6	OFDM	2480	79	GFSK	0.550	0.265	0.815
5220	44	OFDM	2480	79	GFSK	0.757	0.265	1.022
5300	60	OFDM	2480	79	GFSK	0.752	0.265	1.017
5560	112	OFDM	2480	79	GFSK	0.756	0.265	1.021
5660	132	OFDM	2480	79	GFSK	0.757	0.265	1.022
5785	157	OFDM	2480	79	GFSK	0.736	0.265	1.001
					Body **1.6 W/kg (mW/g)** averaged over 1 gram			

To calculate the separation ratio the following formula is used:

$(SAR_1 + SAR_2)^{1.5}/R_i$ where R_i is in mm

For each of the pairs, the following calculations show the separation ratio at the 50 mm separation stated in the installation guide.

2.4 GHz Band: $(0.550+0.265)^{1.5}/50 = 0.02$
5.1 GHz Band: $(0.757+0.265)^{1.5}/50 = 0.02$
5.2 GHz Band: $(0.752+0.265)^{1.5}/50 = 0.02$
5.6 GHz Band: $(0.756+0.265)^{1.5}/50 = 0.02$
5.6 GHz Band: $(0.757+0.265)^{1.5}/50 = 0.02$
5.8 GHz Band: $(0.736+0.265)^{1.5}/50 = 0.02$

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10. Enhanced Energy Coupling

Worst-case test configuration	Band	Antenna-to-person distance (mm)		Peak SAR (W/kg)	Percent Change
Side A	2450 MHz	Initial	8	0.72	-----
		1	13	0.52	-28.4
		2	18	0.31	-56.8
Side B	2450 MHz	Initial	8	0.71	-----
		1	13	0.49	-30.8
		2	18	0.32	-54.3
Side C	2450 MHz	Initial	8	0.92	-----
		1	13	0.63	-31.1
		2	18	0.44	-51.6
Side D	2450 MHz	Initial	8	0.61	-----
		1	13	0.46	-24.4
		2	18	0.27	-55.0
Side E	2450 MHz	Initial	8	0.29	-----
		1	13	0.22	-25.2
		2	18	0.12	-60.2
Side F	2450 MHz	Initial	8	0.18	-----
		1	13	0.13	-29.4
		2	18	0.07	-59.6
Side A	5250 MHz	Initial	8	0.87	-----
		1	13	0.62	-28.4
		2	18	0.36	-58.9
Side B	5250 MHz	Initial	8	1.56	------
		1	13	1.21	-22.5
		2	18	0.79	-49.7
		3	23	0.33	-78.9
Side C	5250 MHz	Initial	8	1.97	-----
		1	13	1.52	-22.8
		2	18	0.90	-54.3
Side D	5250 MHz	Initial	8	0.79	-----
		1	13	0.55	-30.4
		2	18	0.36	-54.6
Side E	5250 MHz	Initial	8	0.41	-----
		1	13	0.28	-31.5
		2	18	0.20	-51.0
Side F	5250 MHz	Initial	8	0.36	-----
		1	13	0.25	-31.1
		2	18	0.14	-59.9

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Worst-case test configuration	Band	Antenna-to-person distance (mm)		Peak SAR (W/kg)	Percent Change
Side A	5600 MHz	Initial	8	1.49	-----
		1	13	1.16	-22.2
		2	18	0.73	-51.3
Side B	5600 MHz	Initial	8	1.38	-----
		1	13	0.95	-31.4
		2	18	0.54	-60.8
Side C	5600 MHz	Initial	8	1.99	-----
		1	13	1.38	-30.7
		2	18	0.96	-51.7
Side D	5600 MHz	Initial	8	1.02	-----
		1	13	0.74	-27.1
		2	18	0.45	-56.1
Side E	5600 MHz	Initial	8	0.51	-----
		1	13	0.37	-28.1
		2	18	0.21	-58.8
Side F	5600 MHz	Initial	8	0.32	-----
		1	13	0.23	-27.5
		2	18	0.14	-56.1
Side A	5800 MHz	Initial	8	1.56	-----
		1	13	1.15	-26.5
		2	18	0.70	-55.3
Side B	5800 MHz	Initial	8	1.31	-----
		1	13	0.89	-32.0
		2	18	0.66	-49.5
		3	23	0.33	-74.9
Side C	5800 MHz	Initial	8	1.69	-----
		1	13	1.15	-31.7
		2	18	0.68	-59.6
Side D	5800 MHz	Initial	8	0.87	-----
		1	13	0.65	-25.6
		2	18	0.34	-60.9
Side E	5800 MHz	Initial	8	0.46	-----
		1	13	0.35	-24.3
		2	18	0.21	-54.4
Side F	5800 MHz	Initial	8	0.28	-----
		1	13	0.21	-23.6
		2	18	0.12	-57.2

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11. Test Equipment List

Table 11.1 Equipment Specifications

Type	Calibration Due Date	Calibration Done Date	Serial Number
ThermoCRS Robot	N/A	N/A	RAF0338198
ThermoCRS Controller	N/A	N/A	RCF0338224
ThermoCRS Teach Pendant (Joystick)	N/A	N/A	STP0334405
IBM Computer, 2.66 MHz P4	N/A	N/A	8189D8U KCPR08N
Aprel E-Field Probe ALS-E020	08/23/2013	08/23/2012	RFE-215
Aprel E-Field Probe ALS-E030	07/09/2013	07/09/2012	E030-001
Aprel Dummy Probe	N/A	N/A	023
Aprel Left Phantom	N/A	N/A	RFE-267
Aprel Right Phantom	N/A	N/A	RFE-268
Speag Validation Dipole D2450V2	12/04/2013	12/04/2012	829
Speag Validation Dipole D5GHzV2	12/11/2013	12/11/2012	1085
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 (2450 MHz)	N/A	N/A	N/A
Body Equivalent Matter (5 GHz)	N/A	N/A	N/A

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12. 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.

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13. 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.

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Appendix A – System Validation Plots and Data

```
************************************************************
Test Result for UIM Dielectric Parameter
Fri 01/Feb/2013 01:58:52
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
2.4200	52.74	1.92	52.58	1.92
2.4300	52.73	1.93	52.56	1.95
2.4370	52.716	1.937	52.539	1.957*
2.4400	52.71	1.94	52.53	1.96
2.4500	52.70	1.95	52.51	1.98
2.4600	52.69	1.96	52.50	1.99
2.4700	52.67	1.98	52.47	2.00
2.4800	52.66	1.99	52.45	2.01

* value interpolated

```
************************************************************
Test Result for UIM Dielectric Parameter
Fri 25/Jan/2013 05:41:45
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
5.1000	49.15	5.18	49.36	5.20
5.1200	49.12	5.21	49.30	5.23
5.1400	49.10	5.23	49.26	5.25
5.1600	49.07	5.25	49.22	5.28
5.1800	49.04	5.28	49.38	5.31
5.2000	49.01	5.30	49.32	5.33
5.2200	48.99	5.32	49.27	5.35
5.2400	48.96	5.35	49.20	5.38
5.2500	48.945	5.36	48.18	5.395*
5.2600	48.93	5.37	49.14	5.41
5.2800	48.91	5.39	49.11	5.43
5.3000	48.88	5.42	49.06	5.45
5.3200	48.85	5.44	48.98	5.47

* value interpolated

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```
************************************************************
Test Result for UIM Dielectric Parameter
Mon 28/Jan/2013 05:56:22
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
5.4800	48.63	5.63	48.62	5.67
5.5000	48.61	5.65	48.60	5.69
5.5200	48.58	5.67	48.58	5.71
5.5400	48.55	5.70	48.54	5.74
5.5600	48.53	5.72	48.52	5.76
5.5800	48.50	5.74	48.48	5.78
5.6000	48.47	5.77	48.44	5.81
5.6200	48.44	5.79	48.42	5.83
5.6400	48.42	5.81	48.40	5.85
5.6600	48.39	5.84	48.37	5.87
5.6800	48.36	5.86	48.34	5.89
5.7000	48.34	5.88	48.30	5.91
5.7200	48.31	5.91	48.27	5.94

```
************************************************************
Test Result for UIM Dielectric Parameter
Thu 31/Jan/2013 05:47:38
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
5.7400	48.28	5.93	48.24	5.96
5.7600	48.25	5.95	48.21	5.98
5.7800	48.23	5.98	48.19	6.02
5.7850	48.223	5.985	48.18	6.025*
5.8000	48.20	6.00	48.15	6.04
5.8200	48.17	6.02	48.12	6.07
5.8400	48.15	6.05	48.09	6.10

* value interpolated

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****
Test Result for UIM Dielectric Parameter
Mon 11/Feb/2013 07:22:37
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
5.1000	49.15	5.18	49.52	5.29
5.1200	49.12	5.21	49.48	5.32
5.1400	49.10	5.23	49.46	5.34
5.1600	49.07	5.25	49.43	5.36
5.1800	49.04	5.28	49.40	5.39
5.2000	49.01	5.30	49.36	5.42
5.2100	49.00	5.31	49.345	5.43*
5.2200	48.99	5.32	49.33	5.44
5.2400	48.96	5.35	49.30	5.47
5.2600	48.93	5.37	49.27	5.49
5.2800	48.91	5.39	49.24	5.51
5.2900	48.895	5.405	49.225	5.52*
5.3000	48.88	5.42	49.21	5.53
5.3200	48.85	5.44	49.19	5.55
5.3400	48.82	5.46	49.16	5.57
5.3600	48.80	5.49	49.13	5.60
5.3800	48.77	5.51	49.11	5.63
5.4000	48.74	5.53	49.09	5.65
5.4200	48.72	5.56	49.06	5.68
5.4400	48.69	5.58	49.03	5.70
5.4600	48.66	5.60	49.00	5.72
5.4800	48.63	5.63	48.97	5.75
5.5000	48.61	5.65	48.95	5.77
5.5200	48.58	5.67	48.92	5.79
5.5400	48.55	5.70	48.89	5.82
5.5600	48.53	5.72	48.87	5.84
5.5800	48.50	5.74	48.84	5.86
5.6000	48.47	5.77	48.81	5.89
5.6100	48.455	5.78	48.795	5.905*
5.6200	48.44	5.79	48.78	5.92
5.6400	48.42	5.81	48.75	5.94
5.6600	48.39	5.84	48.72	5.97
5.6800	48.36	5.86	48.68	5.99
5.7000	48.34	5.88	48.66	6.01
5.7200	48.31	5.91	48.63	6.04
5.7400	48.28	5.93	48.60	6.06
5.7600	48.25	5.95	48.57	6.08
5.7750	48.235	5.973	48.54	6.11*
5.7800	48.23	5.98	48.53	6.12
5.8000	48.20	6.00	48.50	6.14
5.8200	48.17	6.02	48.47	6.17
5.8400	48.15	6.05	48.44	6.20

* value interpolated

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SAR Test Report – Plot 1

By Operator : Jay
Measurement Date : 01-Feb-2013
Starting Time : 01-Feb-2013 02:03:25 PM
End Time : 01-Feb-2013 02:16:19 PM
Scanning Time : 774 secs

Product Data
Device Name : Verification
Serial No. : 829
Type : Dipole
Model : D2450V2
Frequency : 2450.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time : 0 min(s)
Length : 51.5 mm
Width : 3.6 mm
Depth : 30.4 mm
Antenna Type : Internal
Orientation : Touch
Power Drift-Start : 6.390 W/kg
Power Drift-Finish: 6.601 W/kg
Power Drift (%) : 3.301

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 2450
Frequency : 2450.00 MHz
Last Calib. Date : 01-Feb-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 52.51 F/m
Sigma : 1.98 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe 215 - RFEL
Model : E020
Type : E-Field Triangle
Serial No. : 215
Last Calib. Date : 23-Aug-2012
Frequency : 2450.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 3.94
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.56 mm

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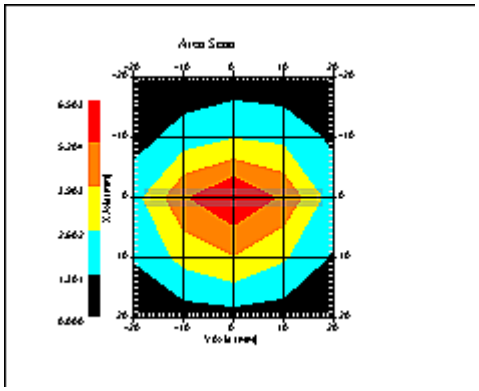
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 01-Feb-2013
Set-up Time       : 7:40:13 AM
Area Scan         : 5x5x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Touch
Separation        : 10 mm
Channel           : Mid
```



```
1 gram SAR value   : 5.130 W/kg
10 gram SAR value  : 2.336 W/kg
Area Scan Peak SAR : 6.503 W/kg
Zoom Scan Peak SAR : 11.390 W/kg
```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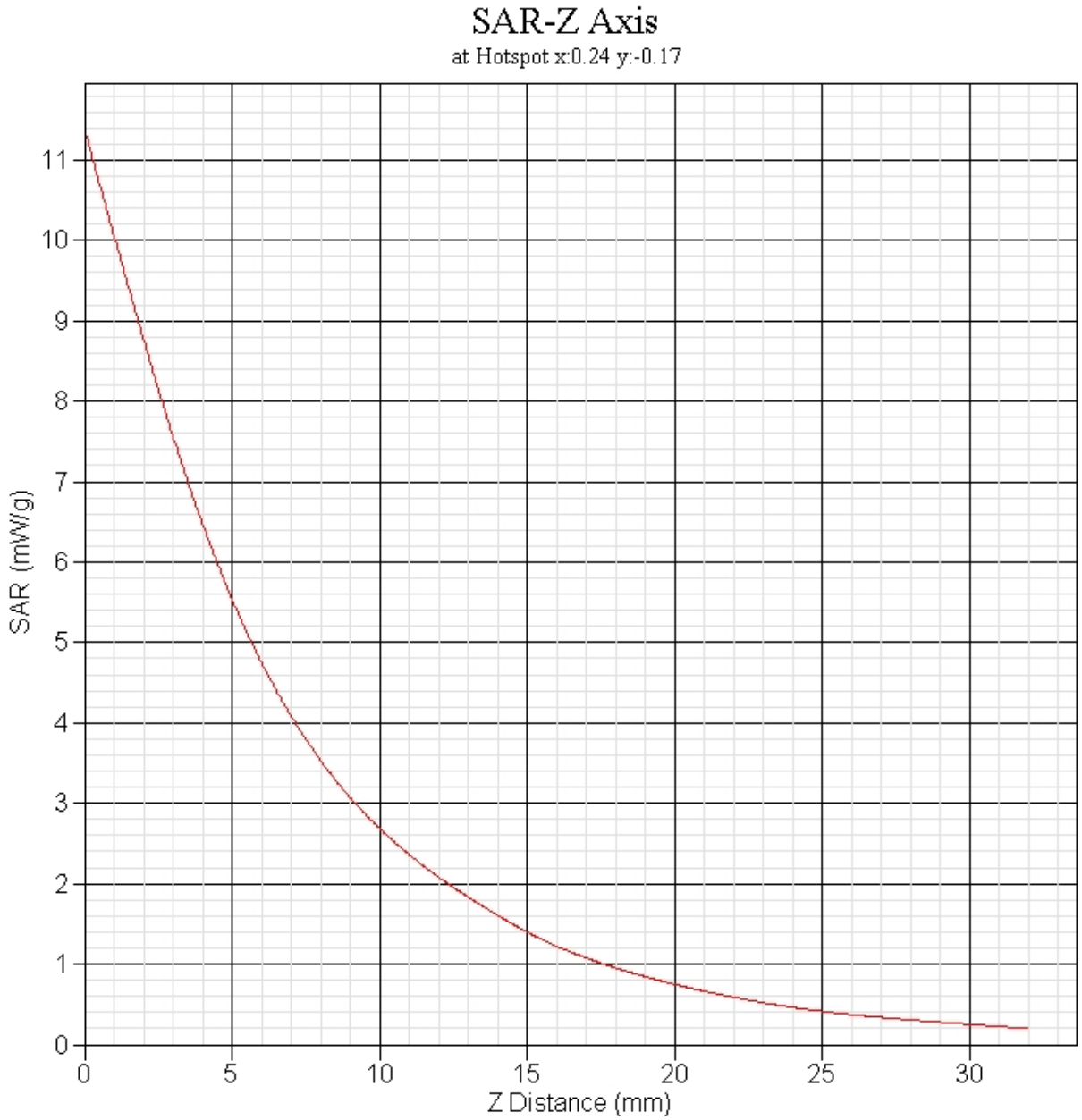

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SAR Test Report – Plot 2

By Operator : Jay
Measurement Date : 25-Jan-2013
Starting Time : 25-Jan-2013 05:50:24 AM
End Time : 25-Jan-2013 06:13:27 AM
Scanning Time : 1383 secs

Product Data
Device Name : Verification
Serial No. : 1085
Type : Dipole
Model : D5GHzV2
Frequency : 5200.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time : 0 min(s)
Length : 23.1 mm
Width : 3.6 mm
Depth : 20.7 mm
Antenna Type : Internal
Orientation : Touch
Power Drift-Start : 8.980 W/kg
Power Drift-Finish: 8.903 W/kg
Power Drift (%) : -0.855

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5200
Frequency : 5200.00 MHz
Last Calib. Date : 25-Jan-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 50.00 RH%
Epsilon : 49.32 F/m
Sigma : 5.33 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe E030-001 - RFEL
Model : E030
Type : E-Field Triangle
Serial No. : E030-001
Last Calib. Date : 09-Jul-2012
Frequency : 5200.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.7
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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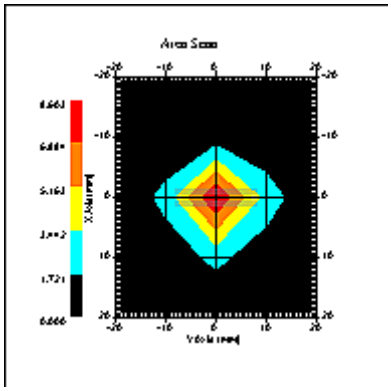
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 25-Jan-2013
Set-up Time       : 9:00:47 AM
Area Scan         : 5x5x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan         : 7x7x10 : Measurement x=4mm, y=4mm, z=2.5mm

Other Data
DUT Position      : Touch
Separation        : 10 mm
Channel           : Mid
```



```
1 gram SAR value   : 7.121 W/kg
10 gram SAR value  : 1.983 W/kg
Area Scan Peak SAR : 9.603 W/kg
Zoom Scan Peak SAR : 24.619 W/kg
```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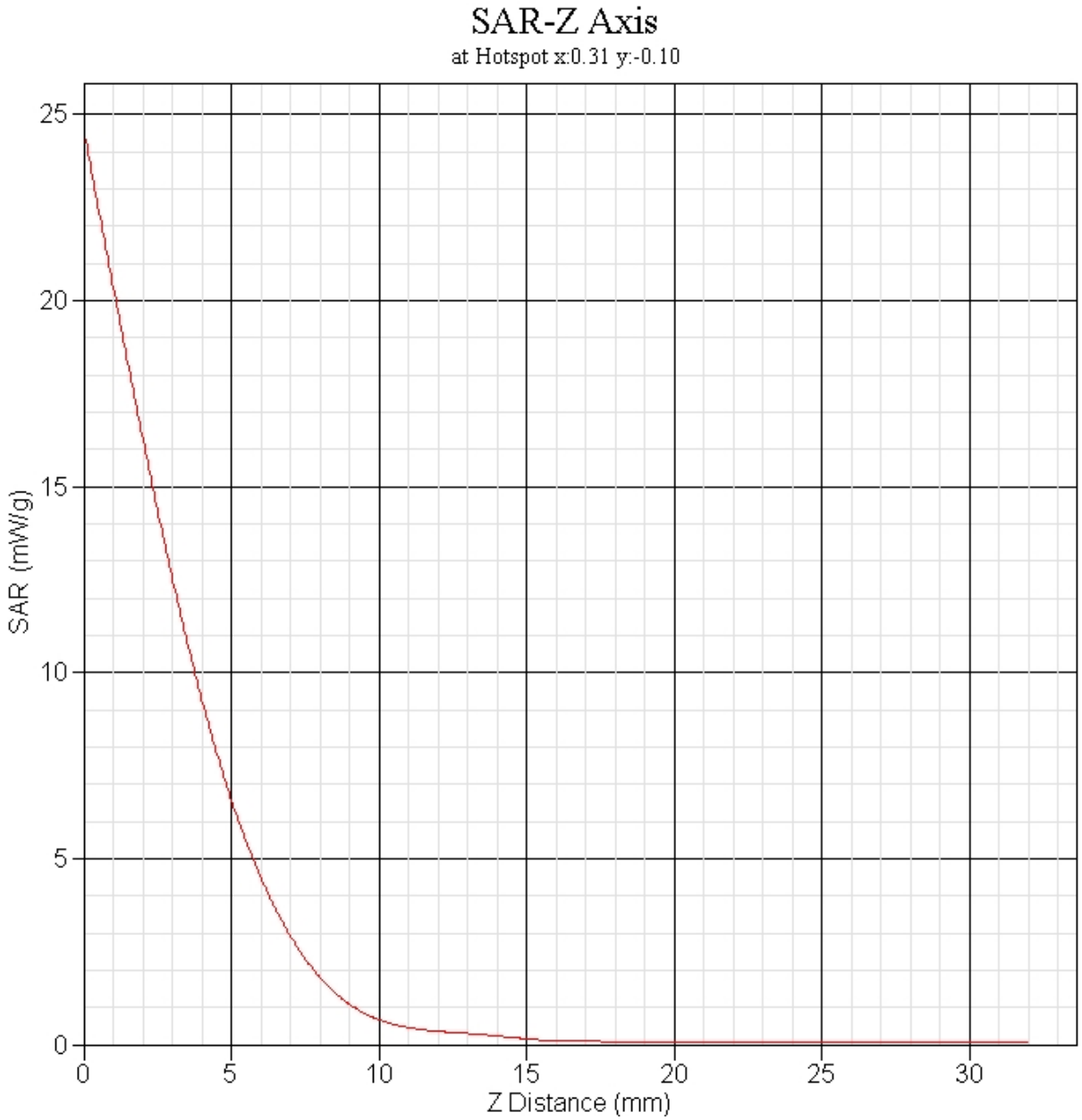

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SAR Test Report – Plot 3

By Operator : Jay
Measurement Date : 28-Jan-2013
Starting Time : 28-Jan-2013 05:58:12 AM
End Time : 28-Jan-2013 06:20:59 AM
Scanning Time : 1367 secs

Product Data
Device Name : Verification
Serial No. : 1085
Type : Dipole
Model : D5GHzV2
Frequency : 5600.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time : 0 min(s)
Length : 23.1 mm
Width : 3.6 mm
Depth : 20.7 mm
Antenna Type : Internal
Orientation : Touch
Power Drift-Start : 8.199 W/kg
Power Drift-Finish: 8.257 W/kg
Power Drift (%) : 0.714

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5600
Frequency : 5600.00 MHz
Last Calib. Date : 28-Jan-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 50.00 RH%
Epsilon : 48.44 F/m
Sigma : 5.81 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe AL-E3P1 - AL
Model : E-030
Type : E-Field Triangle
Serial No. : AL-E3P1
Last Calib. Date : 09-Jul-2012
Frequency : 5600.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.3
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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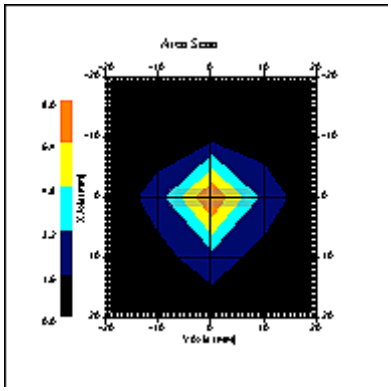
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 28-Jan-2013
Set-up Time       : 8:54:57 AM
Area Scan         : 5x5x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan         : 7x7x10 : Measurement x=4mm, y=4mm, z=2.5mm

Other Data
DUT Position      : Touch
Separation        : 10 mm
Channel           : Mid
```



```
1 gram SAR value   : 7.924 W/kg
10 gram SAR value  : 2.198 W/kg
Area Scan Peak SAR : 9.002 W/kg
Zoom Scan Peak SAR : 22.417 W/kg
```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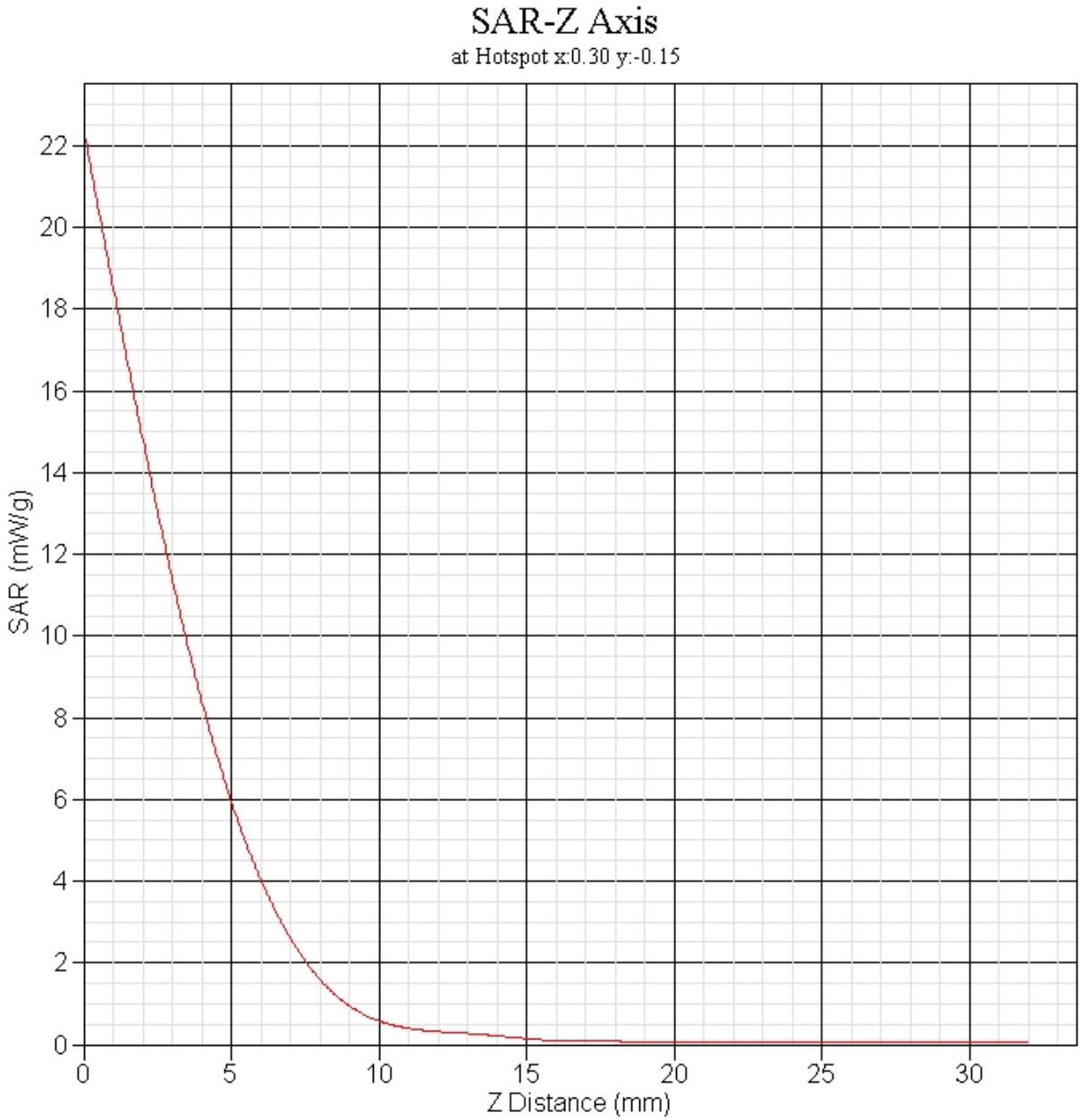

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SAR Test Report – Plot 4

By Operator : Jay
Measurement Date : 31-Jan-2013
Starting Time : 31-Jan-2013 05:50:56 AM
End Time : 31-Jan-2013 06:13:43 AM
Scanning Time : 1367 secs

Product Data
Device Name : Verification
Serial No. : 1085
Type : Dipole
Model : D5GHzV2
Frequency : 5800.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time : 0 min(s)
Length : 23.1 mm
Width : 3.6 mm
Depth : 20.7 mm
Antenna Type : Internal
Orientation : Touch
Power Drift-Start : 7.372 W/kg
Power Drift-Finish: 7.416 W/kg
Power Drift (%) : 0.599

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5800
Frequency : 5800.00 MHz
Last Calib. Date : 31-Jan-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 50.00 RH%
Epsilon : 48.15 F/m
Sigma : 6.04 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe E030-001 - RFEL
Model : E030
Type : E-Field Triangle
Serial No. : E030-001
Last Calib. Date : 09-Jul-2012
Frequency : 5800.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 5.8
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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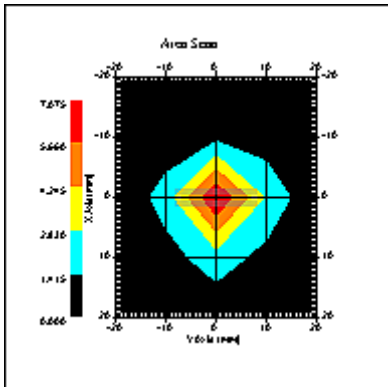
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 31-Jan-2013
Set-up Time       : 4:10:18 PM
Area Scan         : 5x5x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan         : 7x7x10 : Measurement x=4mm, y=4mm, z=2.5mm

Other Data
DUT Position      : Touch
Separation        : 10 mm
Channel           : Mid
```



```
1 gram SAR value   : 7.259 W/kg
10 gram SAR value  : 2.001 W/kg
Area Scan Peak SAR : 7.075 W/kg
Zoom Scan Peak SAR : 20.116 W/kg
```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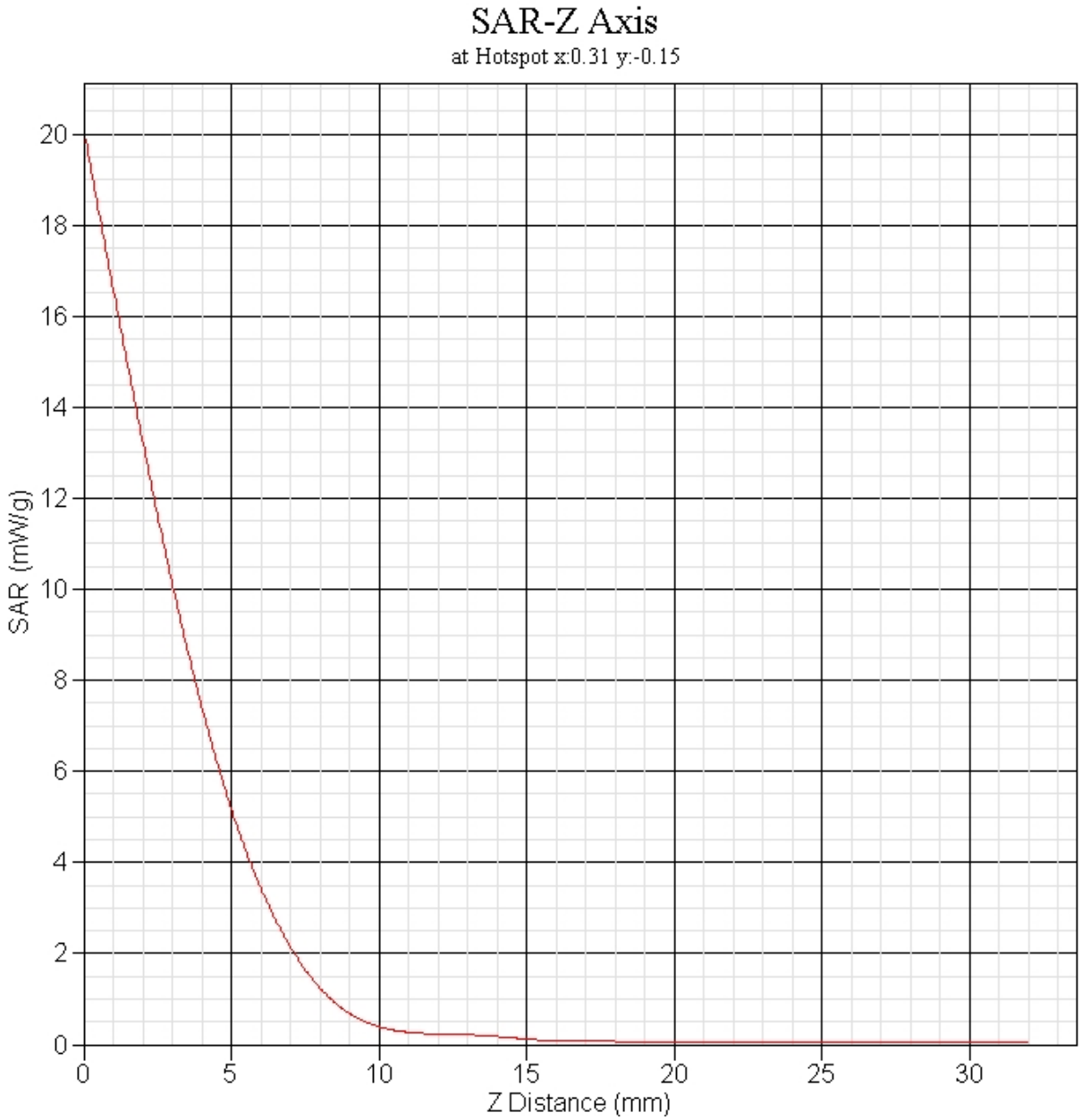

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SAR Test Report – Plot 5

By Operator : Jay
Measurement Date : 11-Feb-2013
Starting Time : 11-Feb-2013 04:12:18 PM
End Time : 11-Feb-2013 04:25:24 PM
Scanning Time : 786 secs

Product Data
Device Name : Verification
Serial No. : 1085
Type : Dipole
Model : D5GHzV2
Frequency : 5200.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time : 0 min(s)
Length : 23.1 mm
Width : 3.6 mm
Depth : 20.7 mm
Antenna Type : Internal
Orientation : Touch
Power Drift-Start : 8.762 W/kg
Power Drift-Finish: 8.643 W/kg
Power Drift (%) : -1.356

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5200
Frequency : 5200.00 MHz
Last Calib. Date : 11-Feb-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 50.00 RH%
Epsilon : 49.36 F/m
Sigma : 5.42 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe E030-001 - RFEL
Model : E030
Type : E-Field Triangle
Serial No. : E030-001
Last Calib. Date : 09-Jul-2012
Frequency : 5200.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.7
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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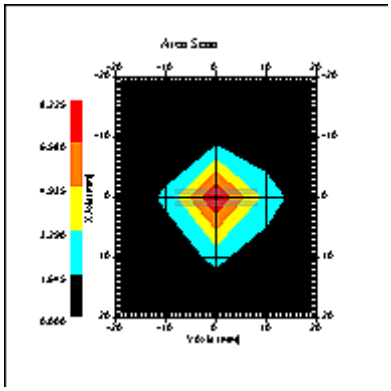
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 11-Feb-2013
Set-up Time       : 9:00:47 AM
Area Scan         : 5x5x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan         : 7x7x10 : Measurement x=4mm, y=4mm, z=2.5mm

Other Data
DUT Position      : Touch
Separation        : 10 mm
Channel           : Mid
```



```
1 gram SAR value   : 7.326 W/kg
10 gram SAR value  : 2.020 W/kg
Area Scan Peak SAR : 8.225 W/kg
Zoom Scan Peak SAR : 24.419 W/kg
```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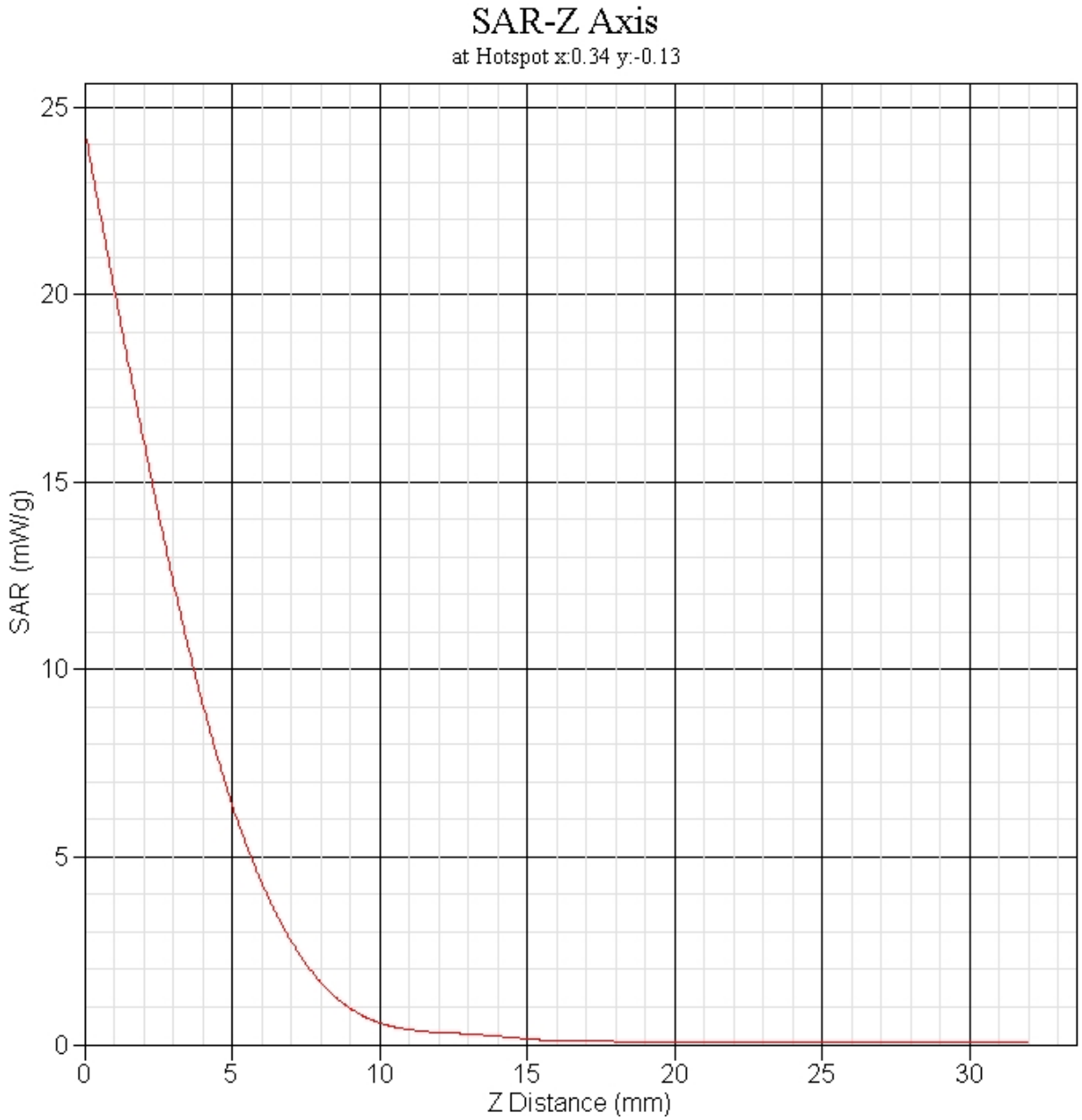

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SAR Test Report – Plot 6

By Operator : Jay
Measurement Date : 11-Feb-2013
Starting Time : 11-Feb-2013 10:12:38 AM
End Time : 11-Feb-2013 10:35:26 AM
Scanning Time : 1368 secs

Product Data
Device Name : Verification
Serial No. : 1085
Type : Dipole
Model : D5GHzV2
Frequency : 5600.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time : 0 min(s)
Length : 23.1 mm
Width : 3.6 mm
Depth : 20.7 mm
Antenna Type : Internal
Orientation : Touch
Power Drift-Start : 8.031 W/kg
Power Drift-Finish: 8.015 W/kg
Power Drift (%) : -0.203

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5600
Frequency : 5600.00 MHz
Last Calib. Date : 11-Feb-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 50.00 RH%
Epsilon : 48.81 F/m
Sigma : 5.89 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe AL-E3P1 - AL
Model : E-030
Type : E-Field Triangle
Serial No. : AL-E3P1
Last Calib. Date : 09-Jul-2012
Frequency : 5600.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.3
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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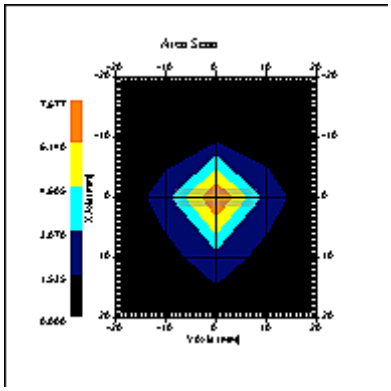
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 11-Feb-2013
Set-up Time       : 8:54:57 AM
Area Scan         : 5x5x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan         : 7x7x10 : Measurement x=4mm, y=4mm, z=2.5mm

Other Data
DUT Position      : Touch
Separation        : 10 mm
Channel           : Mid
```



```
1 gram SAR value   : 7.864 W/kg
10 gram SAR value  : 2.133 W/kg
Area Scan Peak SAR : 7.877 W/kg
Zoom Scan Peak SAR : 26.417 W/kg
```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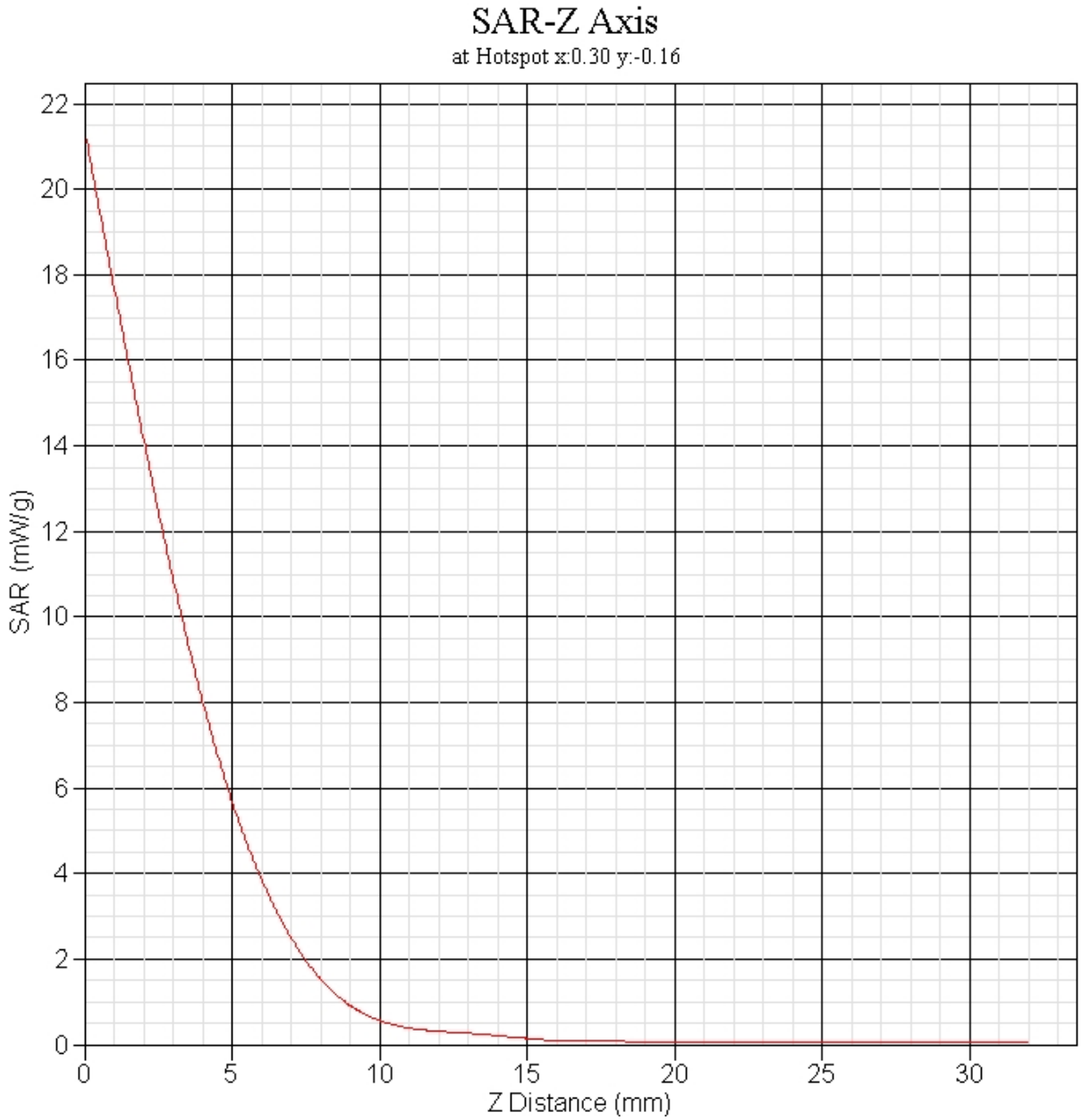

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SAR Test Report – Plot 7

By Operator : Jay
Measurement Date : 11-Feb-2013
Starting Time : 11-Feb-2013 12:42:36 PM
End Time : 11-Feb-2013 01:05:36 PM
Scanning Time : 1380 secs

Product Data
Device Name : Verification
Serial No. : 1085
Type : Dipole
Model : D5GHzV2
Frequency : 5800.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time : 0 min(s)
Length : 23.1 mm
Width : 3.6 mm
Depth : 20.7 mm
Antenna Type : Internal
Orientation : Touch
Power Drift-Start : 7.539 W/kg
Power Drift-Finish: 7.656 W/kg
Power Drift (%) : 1.553

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5800
Frequency : 5800.00 MHz
Last Calib. Date : 11-Feb-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 50.00 RH%
Epsilon : 48.50 F/m
Sigma : 6.14 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe E030-001 - RFEL
Model : E030
Type : E-Field Triangle
Serial No. : E030-001
Last Calib. Date : 09-Jul-2012
Frequency : 5800.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 5.8
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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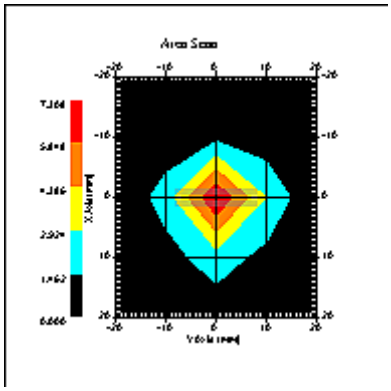
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 11-Feb-2013
Set-up Time       : 4:10:18 PM
Area Scan         : 5x5x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan         : 7x7x10 : Measurement x=4mm, y=4mm, z=2.5mm

Other Data
DUT Position      : Touch
Separation        : 10 mm
Channel           : Mid
```



```
1 gram SAR value   : 7.073 W/kg
10 gram SAR value  : 1.900 W/kg
Area Scan Peak SAR : 7.308 W/kg
Zoom Scan Peak SAR : 22.616 W/kg
```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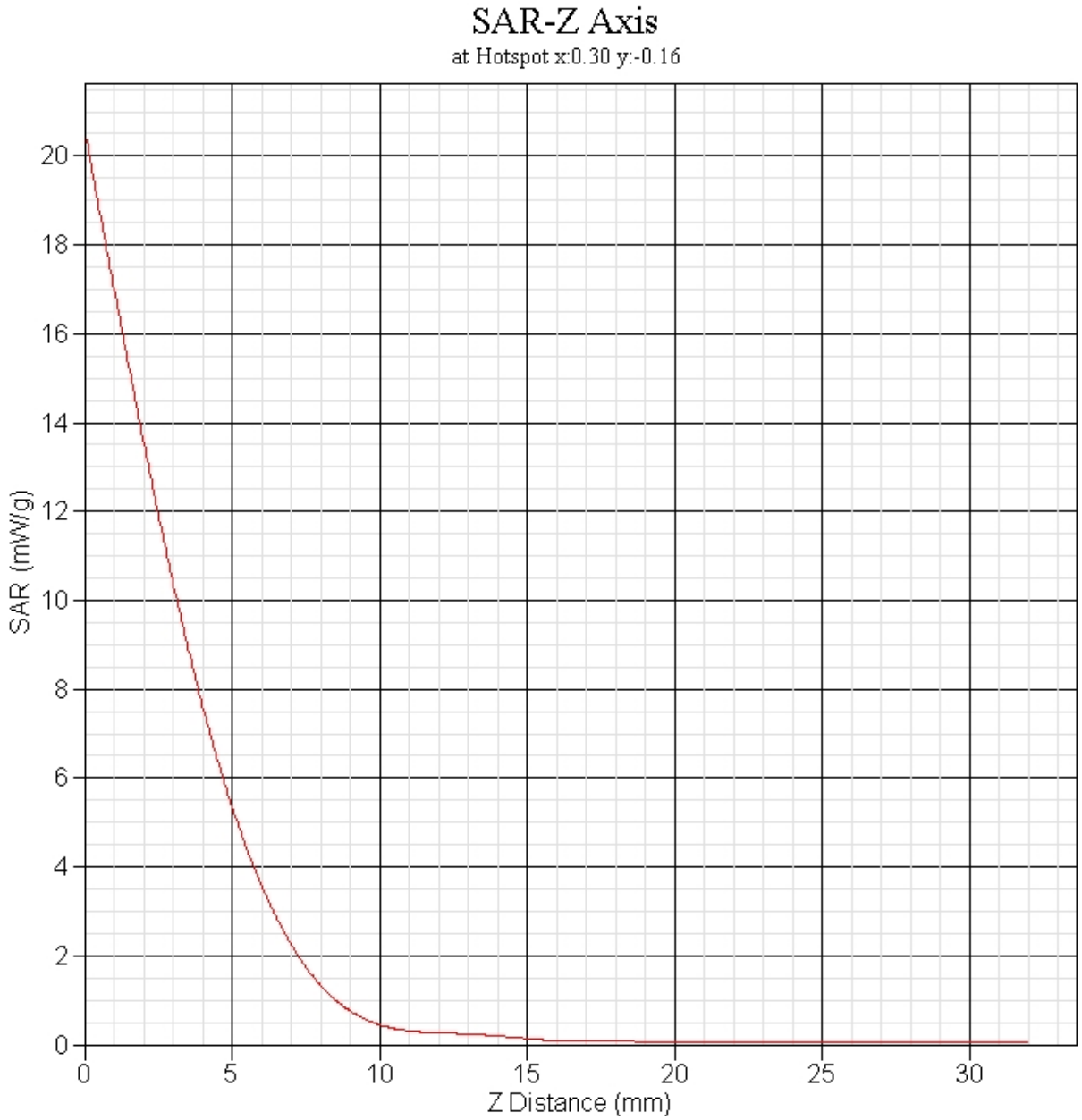

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Appendix B – SAR Test Data Plots

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SAR Test Report – Plot 1

By Operator : Jay
Measurement Date : 02-Feb-2013
Starting Time : 02-Feb-2013 12:15:35 PM
End Time : 02-Feb-2013 12:29:32 PM
Scanning Time : 837 secs

Product Data
Device Name : Intel Corporation
Serial No. : Engineering Sample
Mode : 802.11g
Model : 7260NGW
Frequency : 2437.00 MHz
Drift Time : 0 min(s)
Length : 8 mm
Width : 40 mm
Depth : 75 mm
Antenna Type : Chain 2
Orientation : Side C
Power Drift-Start : 0.664 W/kg
Power Drift-Finish: 0.661 W/kg
Power Drift (%) : -0.443

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 2437
Frequency : 2437.00 MHz
Last Calib. Date : 01-Feb-2012
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 52.539 F/m
Sigma : 1.957 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe 215 - RFEL
Model : E020
Type : E-Field Triangle
Serial No. : 215
Last Calib. Date : 23-Aug-2012
Frequency : 2450.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 4.5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.56 mm

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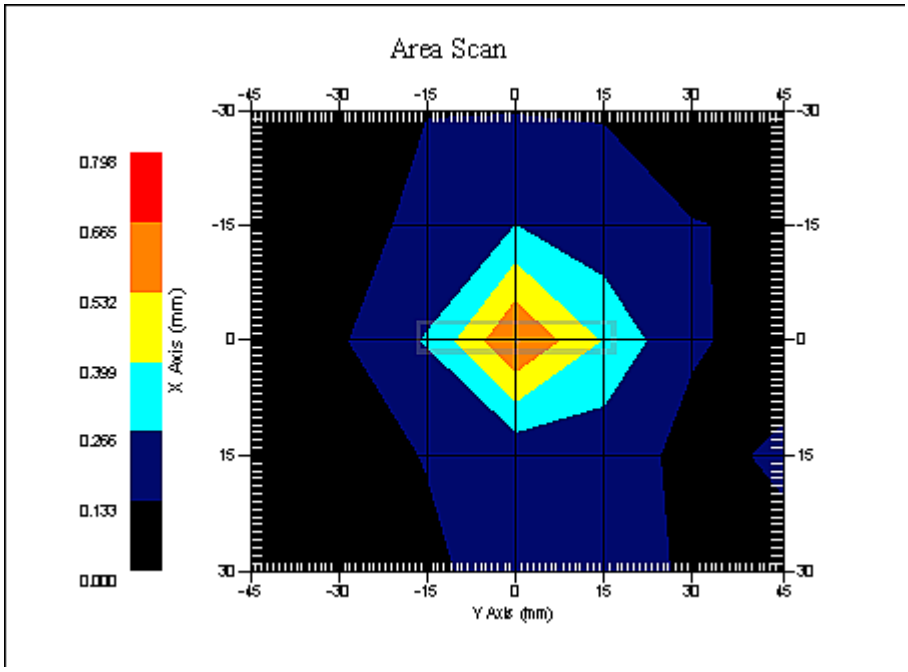
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 01-Feb-2013
Set-up Time       : 9:23:57 AM
Area Scan         : 5x7x1 : Measurement x=15mm, y=15mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Side C
Separation        : 5 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.550 W/kg
10 gram SAR value   : 0.282 W/kg
Area Scan Peak SAR  : 0.667 W/kg
Zoom Scan Peak SAR  : 1.130 W/kg
```

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SAR Test Report – Plot 2

By Operator : Jay
Measurement Date : 27-Jan-2013
Starting Time : 27-Jan-2013 10:51:30 AM
End Time : 27-Jan-2013 11:17:37 AM
Scanning Time : 1567 secs

Product Data
Device Name : Intel Corporation
Serial No. : Engineering Sample
Mode : 802.11a
Model : 7260NGW
Frequency : 5220.00 MHz
Drift Time : 0 min(s)
Length : 8 mm
Width : 40 mm
Depth : 75 mm
Antenna Type : Chain 1
Orientation : Side C
Power Drift-Start : 0.858 W/kg
Power Drift-Finish: 0.859 W/kg
Power Drift (%) : 0.135

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5220
Frequency : 5220.00 MHz
Last Calib. Date : 25-Jan-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 49.27 F/m
Sigma : 5.35 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe E030-001 - RFEL
Model : E030
Type : E-Field Triangle
Serial No. : E030-001
Last Calib. Date : 09-Jul-2012
Frequency : 5200.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.7
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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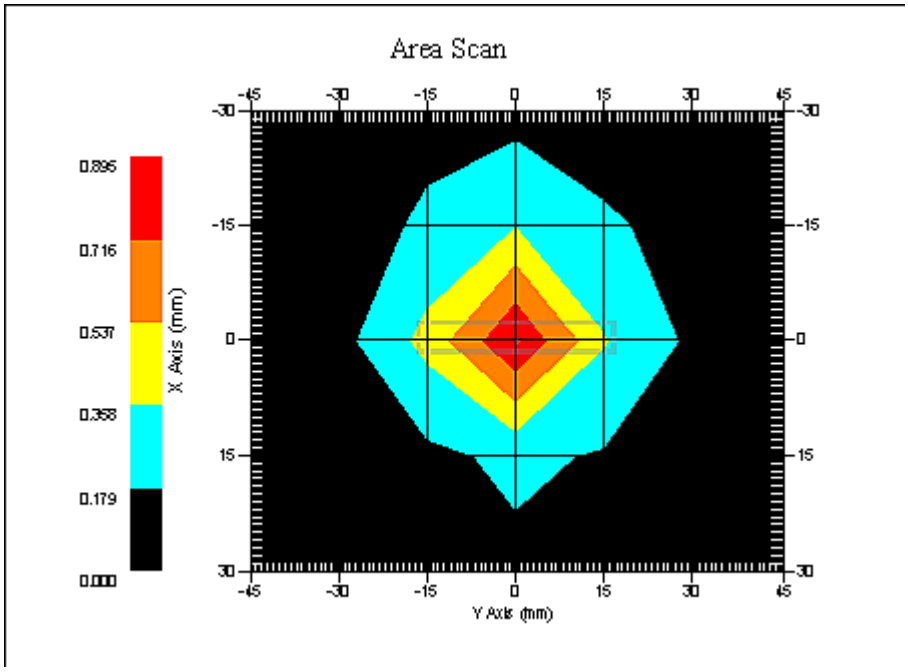
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 27-Jan-2013
Set-up Time       : 5:57:07 AM
Area Scan         : 6x9x1 : Measurement x=10mm, y=10mm, z=2mm
Zoom Scan         : 7x7x15 : Measurement x=4mm, y=4mm, z=2mm

Other Data
DUT Position      : Side C
Separation        : 5 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.757 W/kg
10 gram SAR value   : 0.385 W/kg
Area Scan Peak SAR  : 0.893 W/kg
Zoom Scan Peak SAR  : 1.441 W/kg
```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SAR Test Report – Plot 3

By Operator : Jay
Measurement Date : 27-Jan-2013
Starting Time : 27-Jan-2013 10:25:26 AM
End Time : 27-Jan-2013 10:51:18 AM
Scanning Time : 1552 secs

Product Data
Device Name : Intel Corporation
Serial No. : Engineering Sample
Mode : 802.11a
Model : 7260NGW
Frequency : 5300.00 MHz
Drift Time : 0 min(s)
Length : 8 mm
Width : 40 mm
Depth : 75 mm
Antenna Type : Chain 2
Orientation : Side C
Power Drift-Start : 0.853 W/kg
Power Drift-Finish: 0.855 W/kg
Power Drift (%) : 0.205

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5300
Frequency : 5300.00 MHz
Last Calib. Date : 25-Jan-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 49.06 F/m
Sigma : 5.45 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe E030-001 - RFEL
Model : E030
Type : E-Field Triangle
Serial No. : E030-001
Last Calib. Date : 09-Jul-2012
Frequency : 5200.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.7
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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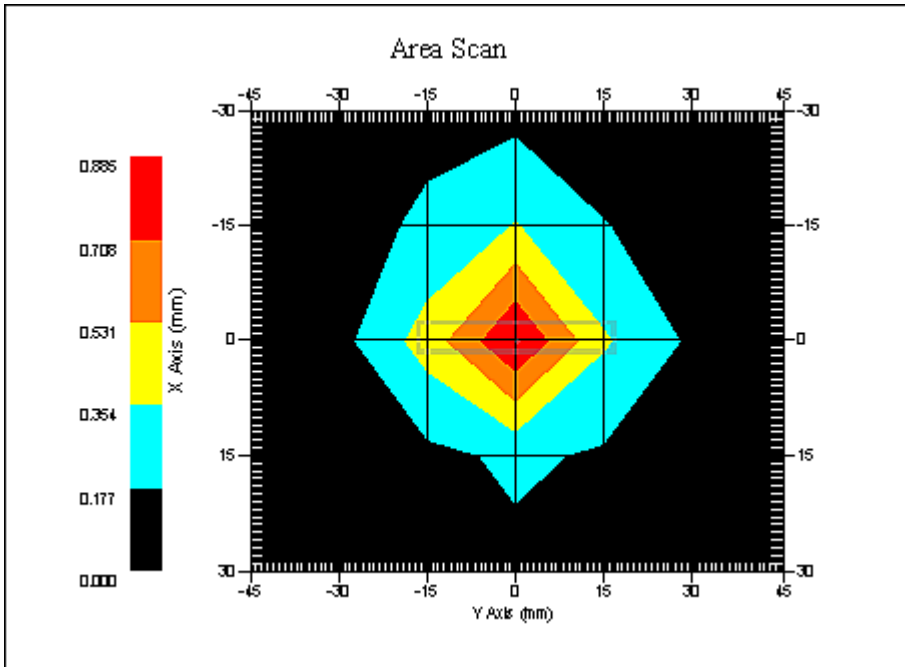
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 27-Jan-2013
Set-up Time       : 5:57:07 AM
Area Scan         : 6x9x1 : Measurement x=10mm, y=10mm, z=2mm
Zoom Scan         : 7x7x15 : Measurement x=4mm, y=4mm, z=2mm

Other Data
DUT Position      : Side C
Separation        : 5 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.752 W/kg
10 gram SAR value   : 0.383 W/kg
Area Scan Peak SAR  : 0.885 W/kg
Zoom Scan Peak SAR  : 1.431 W/kg
```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SAR Test Report – Plot 4

By Operator : Jay
Measurement Date : 29-Jan-2013
Starting Time : 29-Jan-2013 07:17:30 PM
End Time : 29-Jan-2013 07:42:14 PM
Scanning Time : 1484 secs

Product Data
Device Name : Intel Corporation
Serial No. : Engineering Sample
Mode : 802.11
Model : 7260NGW
Frequency : 5560.00 MHz
Drift Time : 0 min(s)
Length : 8 mm
Width : 40 mm
Depth : 75 mm
Antenna Type : Chain 2
Orientation : Side C
Power Drift-Start : 0.871 W/kg
Power Drift-Finish: 0.880 W/kg
Power Drift (%) : 1.111

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5560
Frequency : 5560.00 MHz
Last Calib. Date : 28-Jan-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 48.52 F/m
Sigma : 5.76 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe E030-001 - RFEL
Model : E030
Type : E-Field Triangle
Serial No. : E030-001
Last Calib. Date : 09-Jul-2012
Frequency : 5600.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.3
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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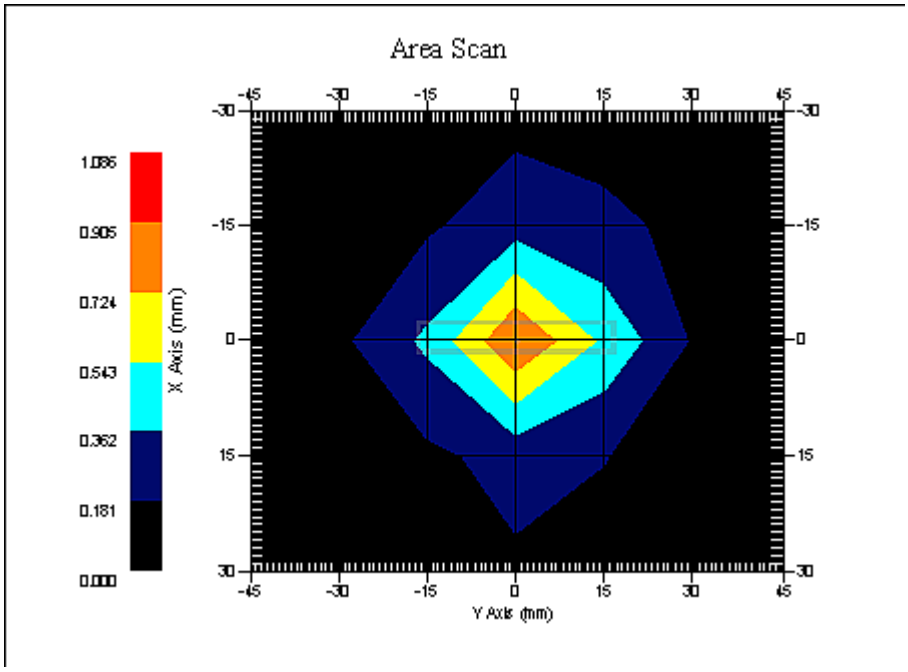
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 29-Jan-2013
Set-up Time       : 6:31:53 AM
Area Scan         : 6x9x1 : Measurement x=10mm, y=10mm, z=2mm
Zoom Scan         : 7x7x15 : Measurement x=4mm, y=4mm, z=2mm

Other Data
DUT Position      : Side C
Separation        : 5 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.756 W/kg
10 gram SAR value   : 0.393 W/kg
Area Scan Peak SAR  : 0.906 W/kg
Zoom Scan Peak SAR  : 1.491 W/kg
```

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SAR Test Report – Plot 5

By Operator : Jay
Measurement Date : 30-Jan-2013
Starting Time : 30-Jan-2013 07:18:11 AM
End Time : 30-Jan-2013 07:42:59 AM
Scanning Time : 1488 secs

Product Data
Device Name : Intel Corporation
Serial No. : Engineering Sample
Mode : 802.11a
Model : 7260NGW
Frequency : 5660.00 MHz
Drift Time : 0 min(s)
Length : 8 mm
Width : 40 mm
Depth : 75 mm
Antenna Type : Chain 2
Orientation : Side C
Power Drift-Start : 0.893 W/kg
Power Drift-Finish: 0.897 W/kg
Power Drift (%) : 0.465

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5660
Frequency : 5660.00 MHz
Last Calib. Date : 28-Jan-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 48.37 F/m
Sigma : 5.87 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe E030-001 - RFEL
Model : E030
Type : E-Field Triangle
Serial No. : E030-001
Last Calib. Date : 09-Jul-2012
Frequency : 5200.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 6.7
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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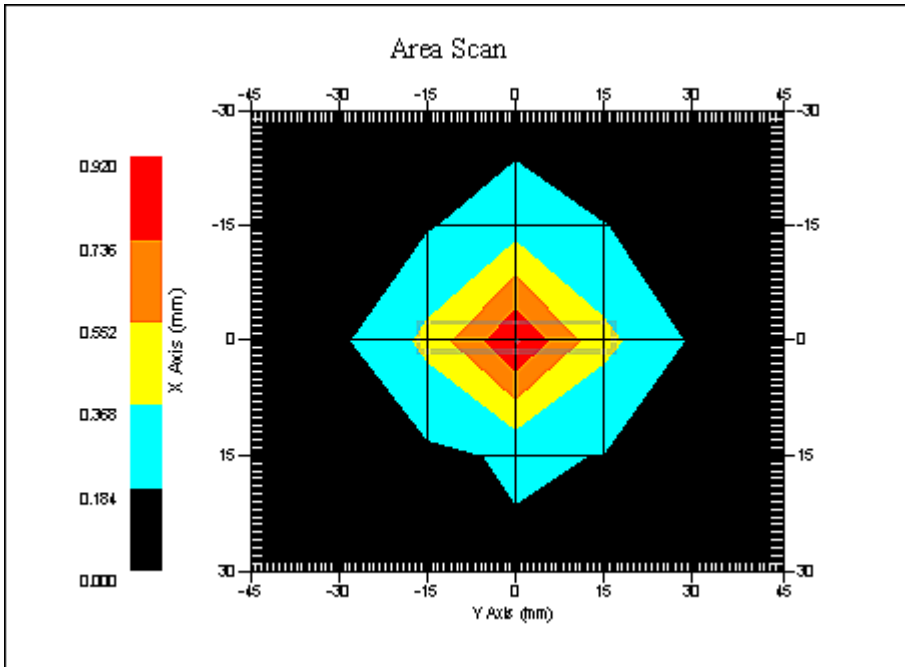
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 30-Jan-2013
Set-up Time       : 6:31:49 AM
Area Scan         : 6x9x1 : Measurement x=10mm, y=10mm, z=2mm
Zoom Scan         : 7x7x15 : Measurement x=4mm, y=4mm, z=2mm

Other Data
DUT Position      : Side C
Separation        : 5 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.757 W/kg
10 gram SAR value   : 0.377 W/kg
Area Scan Peak SAR  : 0.919 W/kg
Zoom Scan Peak SAR  : 1.501 W/kg
```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SAR Test Report – Plot 6

By Operator : Jay
Measurement Date : 30-Jan-2013
Starting Time : 30-Jan-2013 06:24:28 PM
End Time : 30-Jan-2013 06:50:41 PM
Scanning Time : 1573 secs

Product Data
Device Name : Intel Corporation
Serial No. : Engineering Sample
Mode : 802.11a
Model : 7260NGW
Frequency : 5785.00 MHz
Drift Time : 0 min(s)
Length : 8 mm
Width : 40 mm
Depth : 75 mm
Antenna Type : Chain 2
Orientation : Side C
Power Drift-Start : 0.845 W/kg
Power Drift-Finish: 0.864 W/kg
Power Drift (%) : 2.171

Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 5785
Frequency : 5785.00 MHz
Last Calib. Date : 31-Jan-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 48.18 F/m
Sigma : 6.025 S/m
Density : 1000.00 kg/cu. m

Probe Data
Name : Probe E030-001 - RFEL
Model : E030
Type : E-Field Triangle
Serial No. : E030-001
Last Calib. Date : 09-Jul-2012
Frequency : 5800.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 5.8
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.06 mm

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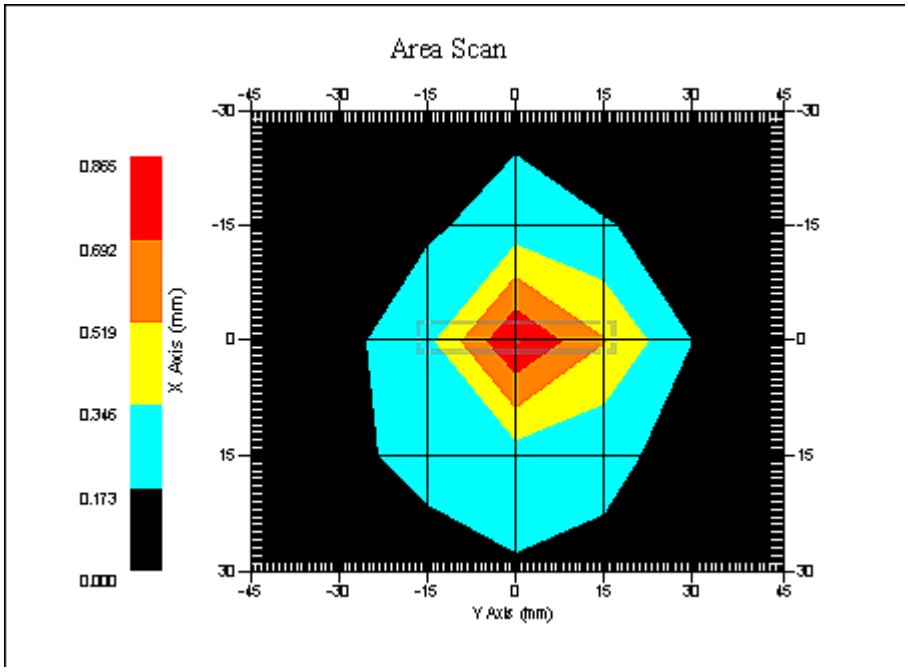
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 30-Jan-2013
Set-up Time       : 5:50:13 PM
Area Scan         : 6x9x1 : Measurement x=10mm, y=10mm, z=2mm
Zoom Scan         : 7x7x15 : Measurement x=4mm, y=4mm, z=2mm

Other Data
DUT Position      : Side C
Separation        : 5 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.736 W/kg
10 gram SAR value   : 0.383 W/kg
Area Scan Peak SAR  : 0.864 W/kg
Zoom Scan Peak SAR  : 1.451 W/kg
```

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Appendix D – Probe Calibration Data Sheets

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NCL CALIBRATION LABORATORIES

Calibration File No.: PC-1442

Client.: RF Exposure Lab

C E R T I F I C A T E O F C A L I B R A T I O N

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

Equipment: Miniature Isotropic RF Probe

Record of Calibration

Head and Body

Manufacturer: APREL Laboratories

Model No.: E-020

Serial No.: 215

Calibration Procedure: D01-032-E020-V2, D22-012-Tissue, D28-002-Dipole
Project No: RFEL-E20-cal-5676

Calibrated: 23rd August 2012
Released on: 23rd August 2012

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

Released By: _____

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1

Division of APREL
TEL: (613) 435-8300
FAX: (613) 435-8306

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the references listed below. Calibration is performed using accepted methodologies as per the references listed below. Probes are calibrated for air, and tissue and the values reported are the results from the physical quantification of the probe through meteorgical practices.

Calibration Method

Probes are calibrated using the following methods.

<1000MHz
TEM Cell for sensitivity in air
Standard phantom using temperature transfer method for sensitivity in tissue

>1000MHz
Waveguide* method to determine sensitivity in air and tissue
*Waveguide is numerically (simulation) assessed to determine the field distribution and power

The boundary effect for the probe is assessed using a standard flat phantom where the probe output is compared against a numerically simulated series of data points

References

- IEEE Standard 1528 (2003) including Amendment 1
  IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- EN 62209-1 (2006)
  Human Exposure to RF Fields from hand-held and body-mounted wireless communication devices - Human models. instrumentation, and procedures-Part 1: Procedure to measure the Specific Absorption Rate (SAR) for hand-held mobile wireless devices
- IEC 62209-2 Ed. 1.0 (2010-03)
  Human exposure to RF fields from hand-held and body-mounted wireless devices - Human models, instrumentation, and procedures - Part 2: specific absorption rate (SAR) for wireless communication devices (30 MHz - 6 GHz)
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

Conditions

Probe 215 was a re-calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 1.5°C
Temperature of the Tissue:	21 °C +/- 1.5°C
Relative Humidity:	< 60%

Primary Measurement Standards

Instrument	**Serial Number**	**Cal date**
Power meter Anritsu MA2408A	90025437	Nov.4, 2012
Power Sensor Anritsu MA2481D	103555	Nov 4, 2012
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2012
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2013

Secondary Measurement Standards

Signal Generator Agilent E4438C -506	MY55182336	June 7, 2013

Attestation

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

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

Art Brennan, Quality Manager

Dan Brooks, Test Engineer

Probe Summary

Probe Type:	E-Field Probe E020
Serial Number:	215
Frequency:	See page 5
Sensor Offset:	1.56
Sensor Length:	2.5
Tip Enclosure:	Composite*
Tip Diameter:	< 2.9 mm
Tip Length:	55 mm
Total Length:	289 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	1.2 $\mu V/(V/m)^2$
Channel Y:	1.2 $\mu V/(V/m)^2$
Channel Z:	1.2 $\mu V/(V/m)^2$
Diode Compression Point:	95 mV

Calibration for Tissue (Head H, Body B)

Frequency	Tissue Type	Measured Epsilon	Measured Sigma	Calibration Uncertainty	Tolerance Uncertainty for 5%*	Conversion Factor
450 H	**Head**	**43.98**	**0.9**	**4.1**	**3.6**	**6**
450 B	**Body**	**56.77**	**0.99**	**4.1**	**3.6**	**6.0**
650 B	**Body**	**57.42**	**0.91**	**3.96**	**3.5**	**6.2**
750 H	**Head**	X	X	X	X	X
750 B	**Body**	**55.54**	**0.94**	**3.94**	**3.4**	**6.3**
835 H	**Head**	**42.5**	**0.93**	**3.5**	**3.4**	**6.4**
835 B	**Body**	**56.37**	**0.954**	**3.5**	**3.4**	**6.4**
900 H	**Head**	**41.89**	**1.0**	**3.5**	**3.4**	**6.1**
900 B	**Body**	**53.68**	**1.05**	**3.5**	**3.4**	**6.1**
1450 H	Head	X	X	X	X	X
1450 B	Body	X	X	X	X	X
1500 H	Head	X	X	X	X	X
1500 B	Body	X	X	X	X	X
1640 H	**Head**	**39.0**	**1.25**	**3.5**	**2.7**	**5.2**
1640 B	**Body**	**52.03**	**1.39**	**3.5**	**2.7**	**5.0**
1735 H	Head	X	X	X	X	X
1735 B	**Body**	**52.88**	**1.5**	**3.5**	**2.7**	**5.5**
1800 H	**Head**	X	X	X	X	X
1800 B	**Body**	X	X	X	X	X
1900 H	**Head**	**38.88**	**1.43**	**3.5**	**2.7**	**5.5**
1900 B	**Body**	**51.57**	**1.57**	**3.5**	**2.7**	**5.3**
2000 H	Head	X	X	X	X	X
2000 B	Body	X	X	X	X	X
2100 H	Head	X	X	X	X	X
2100 B	Body	X	X	X	X	X
2300 H	Head	X	X	X	X	X
2300 B	Body	X	X	X	X	X
2450 H	**Head**	**38.2**	**1.82**	**3.5**	**3.5**	**3.91**
2450B	**Body**	**51.74**	**1.96**	**3.5**	**3.5**	**3.94**
2600 H	Head	X	X	X	X	X
2600 B	Body	X	X	X	X	X
3000 H	Head	X	X	X	X	X
3000 B	Body	X	X	X	X	X
3600 H	Head	X	X	X	X	X
3600 B	Body	X	X	X	X	X
5200 H	Head	X	X	X	X	X
5200 B	Body	X	X	X	X	X
5600 H	Head	X	X	X	X	X
5600 B	Body	X	X	X	X	X
5800 H	Head	X	X	X	X	X
5800 B	Body	X	X	X	X	X

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2.1% for the distance between the tip of the probe and the tissue boundary, when less than 0.58mm.

Spatial Resolution:

The spatial resolution uncertainty is less than 1.5% for 4.9mm diameter probe.
The spatial resolution uncertainty is less than 1.0% for 2.5mm diameter probe.

DAQ-PAQ Contribution

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

Boundary Effect:

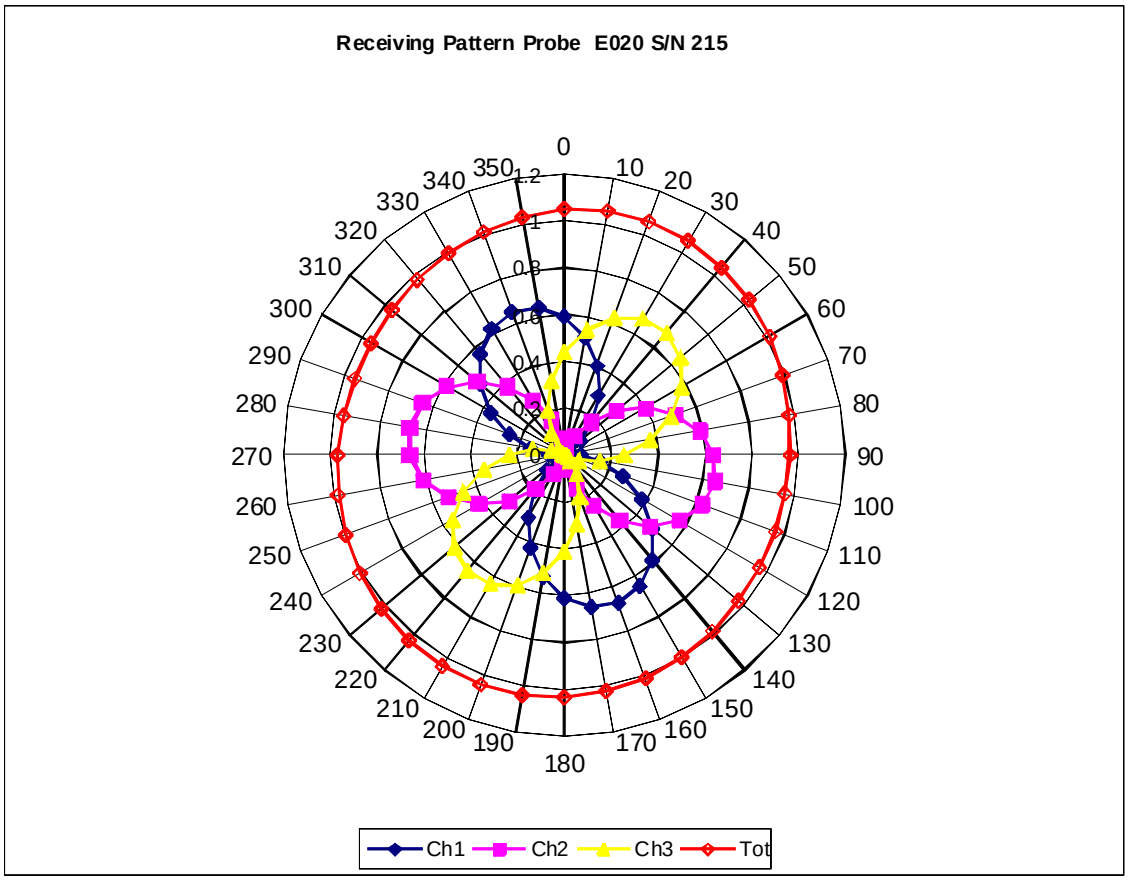
For a distance of 0.58mm the worst case evaluated uncertainty (increase in the probe sensitivity) is less than 2.1%.

NOTES:

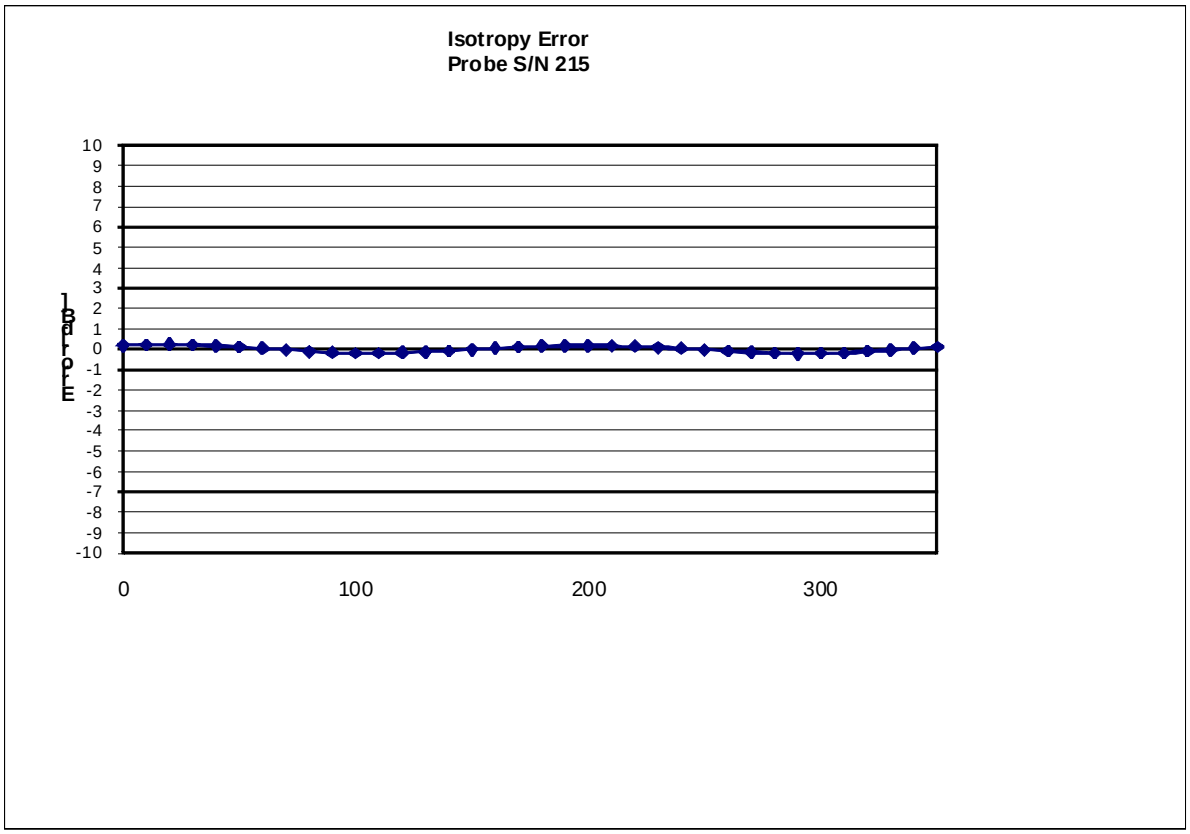
*The maximum deviation from the centre frequency when comparing the lower to upper range is listed.

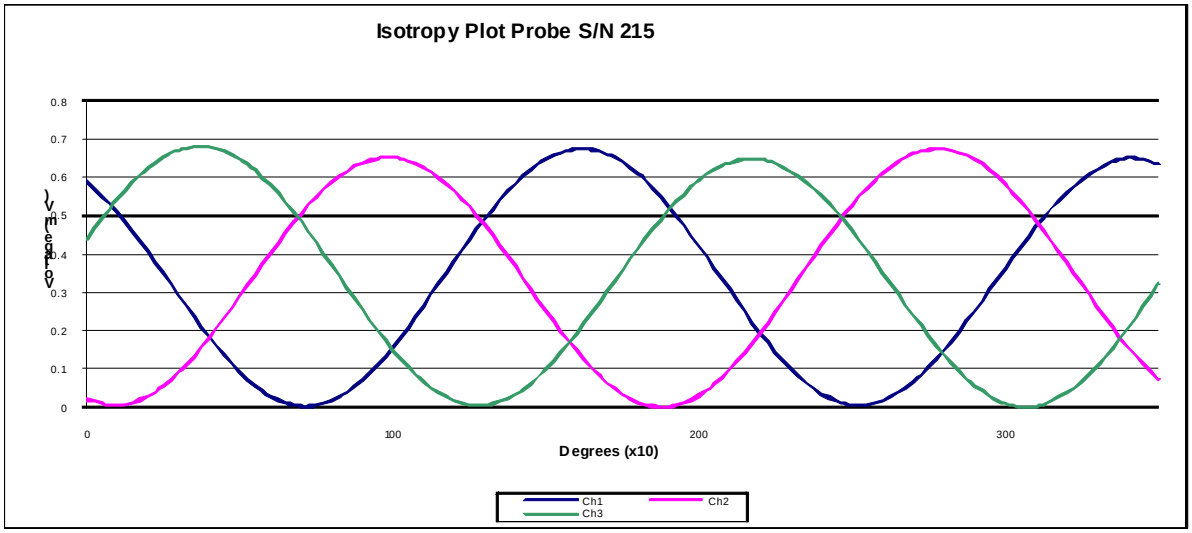
The probe was received in good condition.

Receiving Pattern Air



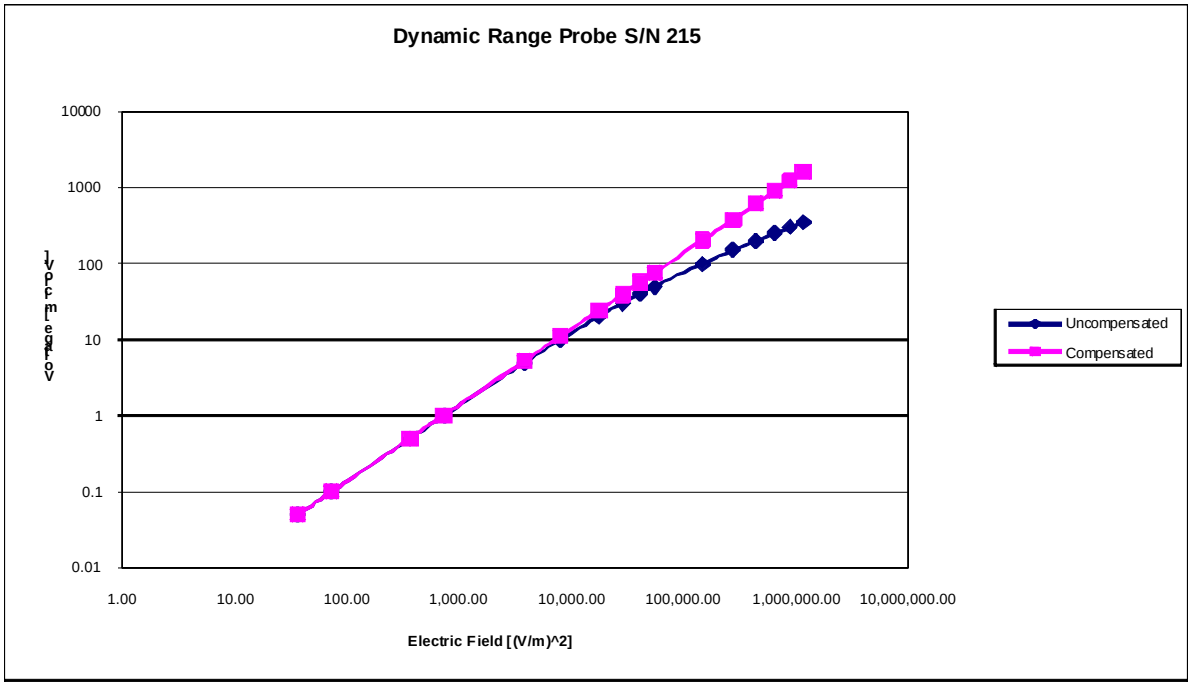
Isotropy Error



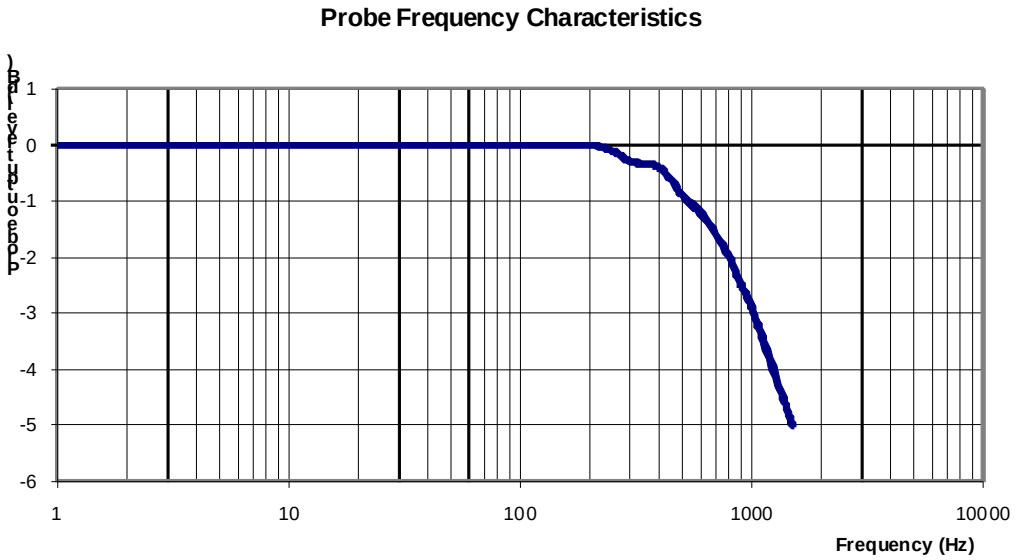


Isotropicity Tissue: 0.12 dB

Dynamic Range



Video Bandwidth



Video Bandwidth at 500 Hz	1 dB
Video Bandwidth at 1.02 KHz:	3 dB

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2012.

NCL CALIBRATION LABORATORIES

Calibration File No.: 1421, 1422 & 1423

Client.: RF Exposure Laboratories

C E R T I F I C A T E O F C A L I B R A T I O N

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

Equipment: Miniature Isotropic RF Probe
Record of Calibration
Head and Body
Manufacturer: APREL Laboratories
Model No.: E-030
Serial No.: E030-001

Calibration Procedure: D01-032-E020-V2, D22-012-Tissue, D28-002-Dipole
Project No: RFEL-5670

Calibrated: 9th July 2012
Released on: 10h July 2012

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

Released By: _____

Art Brennan, Quality Manager

NCL CALIBRATION LABORATORIES

303 Terry Fox Drive, Suite 102
Kanata, Ontario
CANADA K2K 3J1

Division of APREL
TEL: (613) 435-8300
FAX: (613) 435-8306

Introduction

This Calibration Report reproduces the results of the calibration performed in line with the references listed below. Calibration is performed using accepted methodologies as per the references listed below. Probes are calibrated for air, and tissue and the values reported are the results from the physical quantification of the probe through meteorgical practices.

Calibration Method

Probes are calibrated using the following methods.

<1000MHz
TEM Cell for sensitivity in air
Standard phantom using temperature transfer method for sensitivity in tissue

>1000MHz
Waveguide* method to determine sensitivity in air and tissue
*Waveguide is numerically (simulation) assessed to determine the field distribution and power

The boundary effect for the probe is assessed using a standard flat phantom where the probe output is compared against a numerically simulated series of data points

References

- IEEE Standard 1528 (2003) including Amendment 1
  IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
- EN 62209-1 (2006)
  Human Exposure to RF Fields from hand-held and body-mounted wireless communication devices - Human models. instrumentation, and procedures-Part 1: Procedure to measure the Specific Absorption Rate (SAR) for hand-held mobile wireless devices
- IEC 62209-2 Ed. 1.0 (2010-03)
  Human exposure to RF fields from hand-held and body-mounted wireless devices - Human models, instrumentation, and procedures - Part 2: specific absorption rate (SAR) for wireless communication devices (30 MHz - 6 GHz)
- TP-D01-032-E020-V2 E-Field probe calibration procedure
- D22-012-Tissue dielectric tissue calibration procedure
- D28-002-Dipole procedure for validation of SAR system using a dipole
- IEEE 1309 Draft Standard for Calibration of Electromagnetic Field Sensors and Probes, Excluding Antennas, from 9kHz to 40GHz

Conditions

Probe E030-001 was a re-calibration.

Ambient Temperature of the Laboratory:	22 °C +/- 1.5°C
Temperature of the Tissue:	21 °C +/- 1.5°C
Relative Humidity:	< 60%

Primary Measurement Standards

Instrument	**Serial Number**	**Cal due date**
Power meter Anritsu MA2408A	90025437	Nov.4, 2012
Power Sensor Anritsu MA2481D	103555	Nov 4, 2012
Attenuator HP 8495A (70dB)	1944A10711	Sept. 14, 2012
Network Analyzer Anritsu MT8801C	MB11855	Feb. 8, 2013

Secondary Measurement Standards

Signal Generator Agilent E4438C -506	MY55182336	June 7, 2013

Attestation

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

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

Art Brennan, Quality Manager

Dan Brooks, Test Engineer

Probe Summary

Probe Type:	E-Field Probe E030
Serial Number:	E030-001
Frequency:	As presented on page 5
Sensor Offset:	0.56
Sensor Length:	2.5
Tip Enclosure:	Composite*
Tip Diameter:	< 2.9 mm
Tip Length:	55 mm
Total Length:	289 mm

*Resistive to recommended tissue recipes per IEEE-1528

Sensitivity in Air

Channel X:	1.2 $\mu V/(V/m)^2$
Channel Y:	1.2 $\mu V/(V/m)^2$
Channel Z:	1.2 $\mu V/(V/m)^2$
Diode Compression Point:	95 mV

Calibration for Tissue (Head H, Body B)

Frequency	Tissue Type	Measured Epsilon	Measured Sigma	Calibration Uncertainty	Tolerance Uncertainty for 5%*	Conversion Factor
450 H	Head	X	X	X	X	X
450 B	Body	X	X	X	X	X
750 H	Head	X	X	X	X	X
750 B	Body	X	X	X	X	X
835 H	Head	X	X	X	X	X
835 B	Body	X	X	X	X	X
900 H	Head	X	X	X	X	X
900 B	Body	X	X	X	X	X
1450 H	Head	X	X	X	X	X
1450 B	Body	X	X	X	X	X
1500 H	Head	X	X	X	X	X
1500 B	Body	X	X	X	X	X
1640 H	Head	X	X	X	X	X
1640 B	Body	X	X	X	X	X
1750 H	Head	X	X	X	X	X
1750 B	Body	X	X	X	X	X
1800 H	Head	X	X	X	X	X
1800 B	Body	X	X	X	X	X
1900 H	Head	X	X	X	X	X
1900 B	Body	X	X	X	X	X
2000 H	Head	X	X	X	X	X
2000 B	Body	X	X	X	X	X
2100 H	Head	X	X	X	X	X
2100 B	Body	X	X	X	X	X
2300 H	Head	X	X	X	X	X
2300 B	Body	X	X	X	X	X
2450 H	Head	X	X	X	X	X
2450B	Body	X	X	X	X	X
2600 H	Head	X	X	X	X	X
2600 B	Body	X	X	X	X	X
3000 H	Head	X	X	X	X	X
3000 B	Body	X	X	X	X	X
3600 H	Head	X	X	X	X	X
3600 B	Body	X	X	X	X	X
5200 H	**Head**	**34.14**	**4.46**	**3.5**	**2.6**	**7.2**
5200 B	**Body**	**46.65**	**5.19**	**3.5**	**2.6**	**6.7**
5600 H	**Head**	**33.78**	**5.09**	**3.5**	**2.6**	**6.8**
5600 B	**Body**	**45.98**	**5.8**	**3.5**	**2.6**	**6.3**
5800 H	**Head**	**33.56**	**5.32**	**3.5**	**2.6**	**6.6**
5800 B	**Body**	**45.94**	**6.13**	**3.5**	**2.6**	**5.8**

Boundary Effect:

Uncertainty resulting from the boundary effect is less than 2.1% for the distance between the tip of the probe and the tissue boundary, when less than 0.58mm.

Spatial Resolution:

The spatial resolution uncertainty is less than 1.5% for 4.9mm diameter probe.
The spatial resolution uncertainty is less than 1.0% for 2.5mm diameter probe.

DAQ-PAQ Contribution

To minimize the uncertainty calculation all tissue sensitivity values were calculated using a load impedance of 5 MΩ.

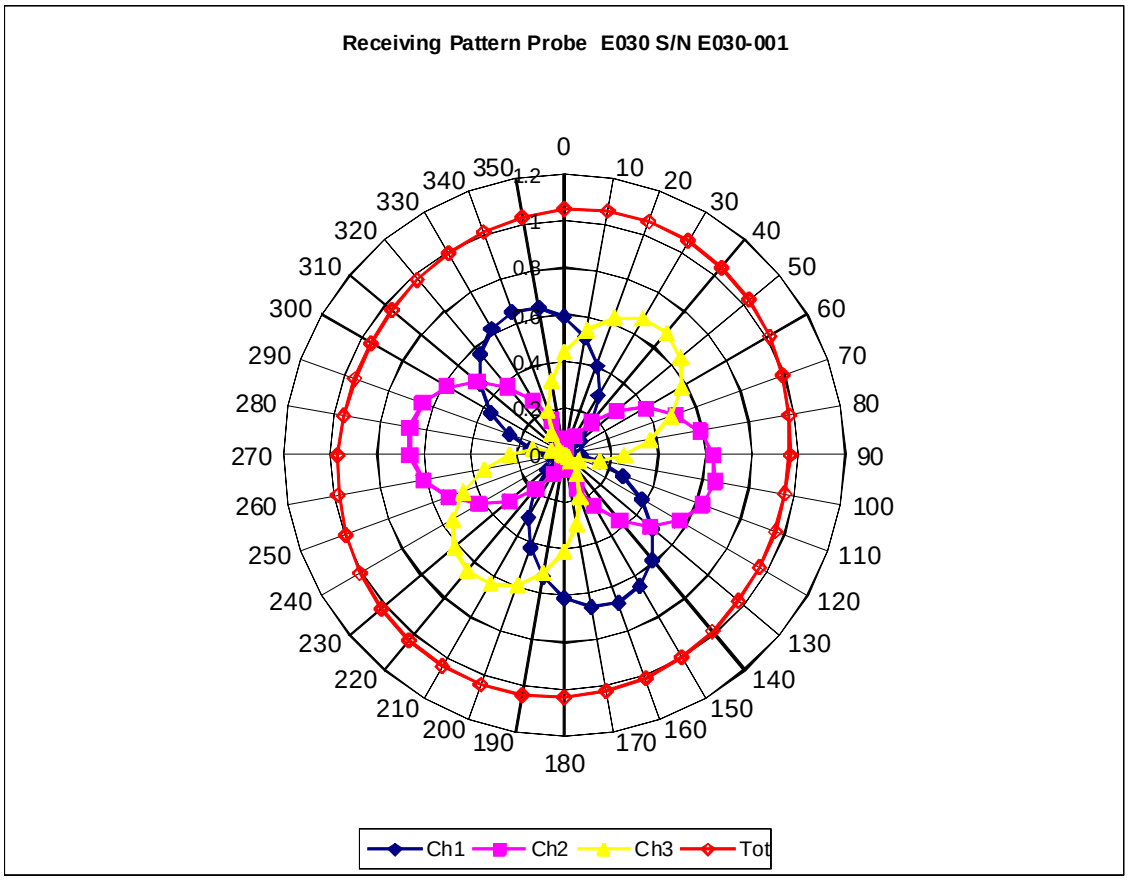
Boundary Effect:

For a distance of 0.58mm the worst case evaluated uncertainty (increase in the probe sensitivity) is less than 2.1%.

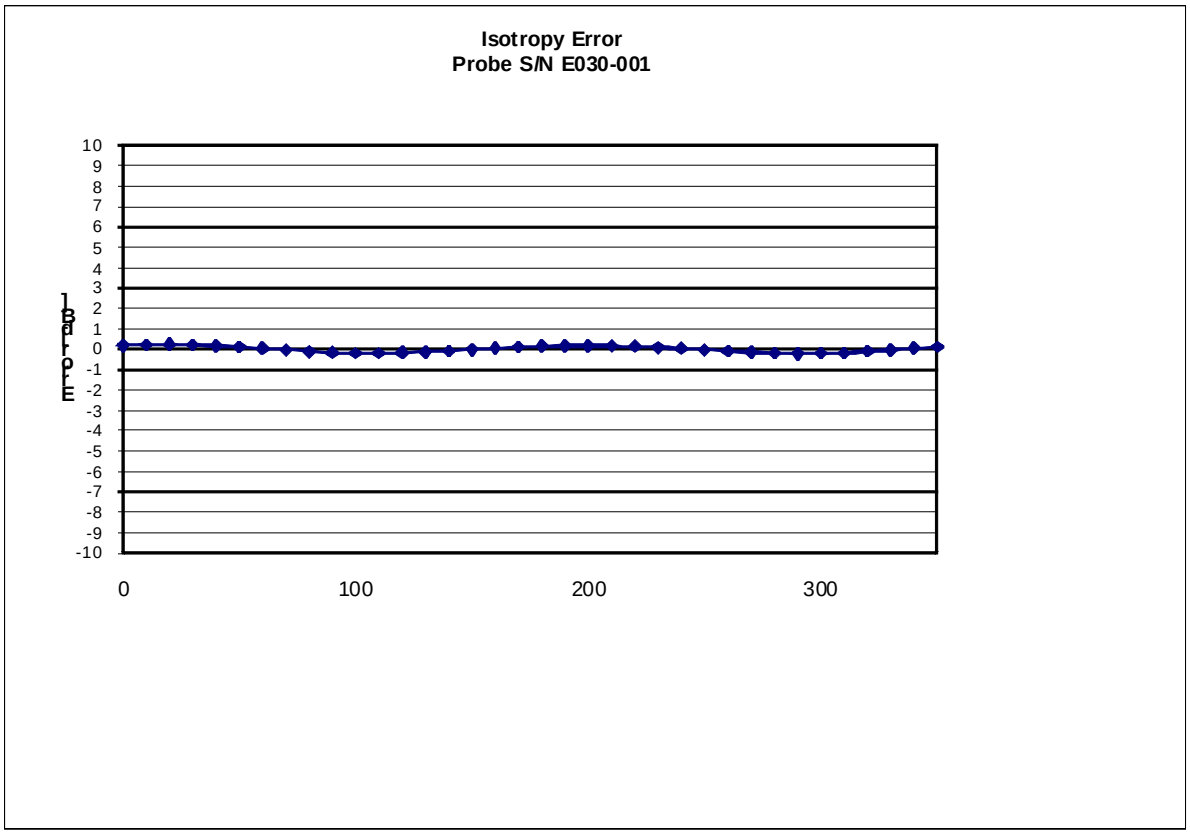
NOTES:

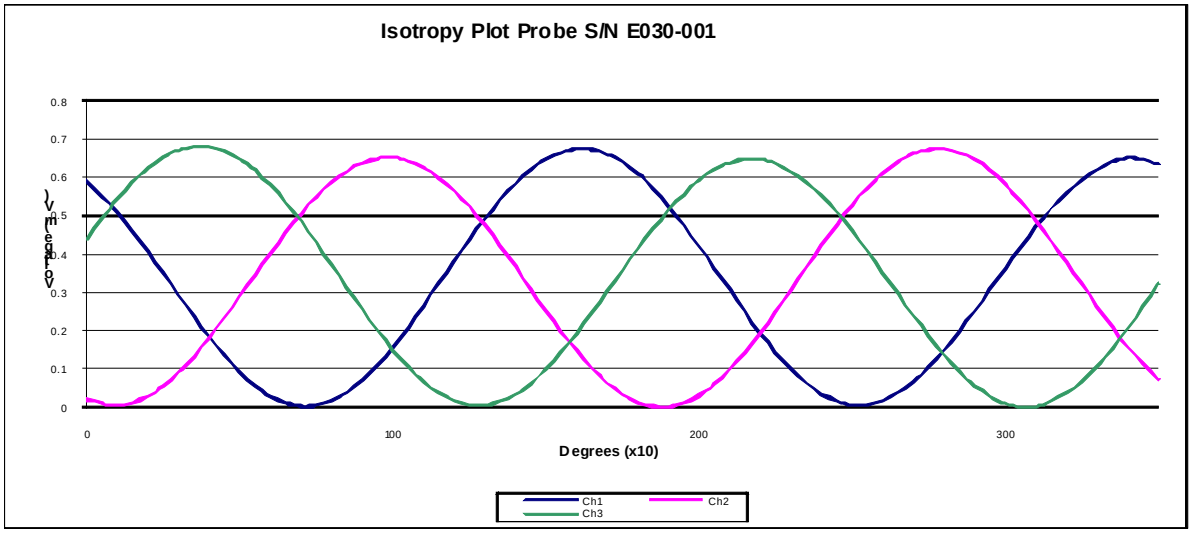
*The maximum deviation from the centre frequency when comparing the lower to upper range is listed.

Receiving Pattern Air



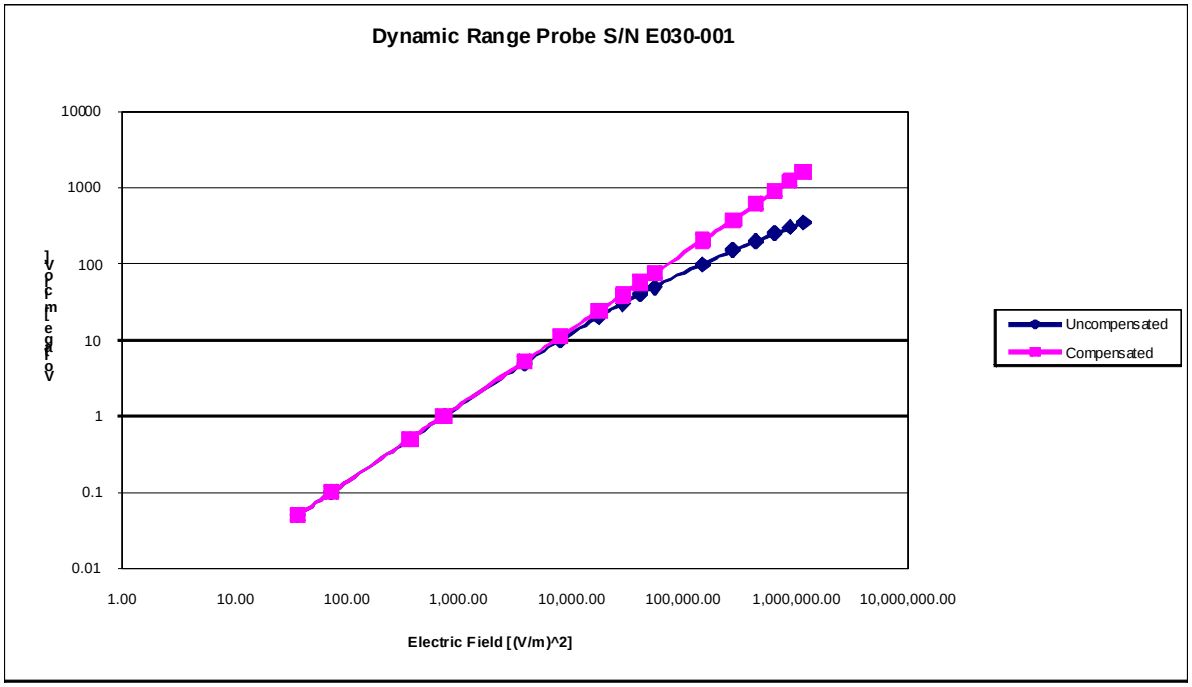
Isotropy Error Air



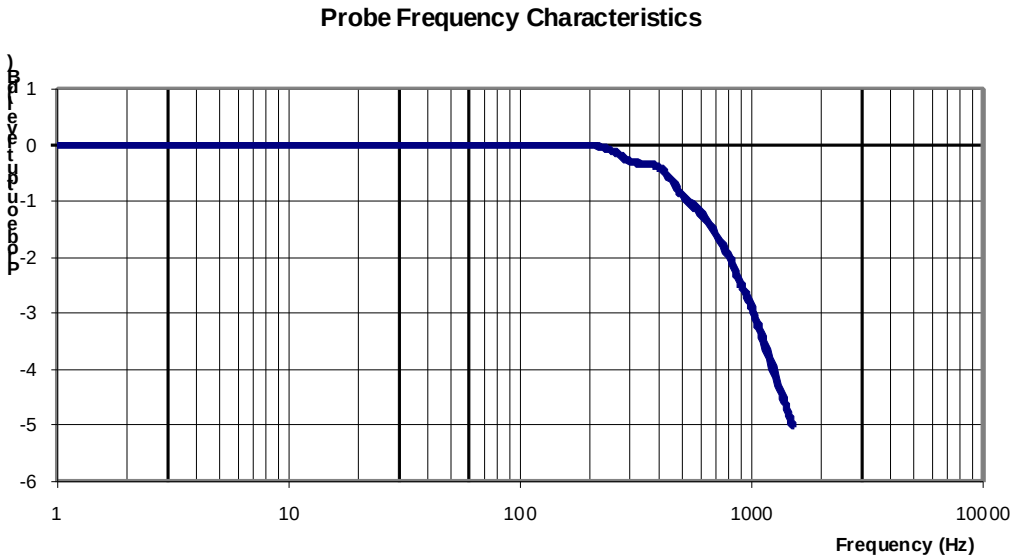


Isotropicity Tissue: 0.10 dB

Dynamic Range



Video Bandwidth



Video Bandwidth at 500 Hz	1 dB
Video Bandwidth at 1.02 KHz:	3 dB

Test Equipment

The test equipment used during Probe Calibration, manufacturer, model number and, current calibration status are listed and located on the main APREL server R:\NCL\Calibration Equipment\Instrument List May 2012.

Appendix E – Dipole Calibration Data Sheets

This report shall not be reproduced except in full without the written approval of RF Exposure Lab, LLC.

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
Servizio svizzero di taratura
S Swiss Calibration Service

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

Accreditation No.: SCS 108

Client **RF Exposure Lab**

Certificate No: D2450V2-829_Dec12

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 829
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	December 04, 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:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 4, 2012

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

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	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	38.2 ± 6 %	1.84 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	13.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.1 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	50.7 ± 6 %	2.02 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	13.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 W/kg ± 16.5 % (k=2)**

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.1 Ω + 4.2 jΩ
Return Loss	- 25.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.7 Ω + 5.1 jΩ
Return Loss	- 25.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.158 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 11, 2008

Date: 04.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 829

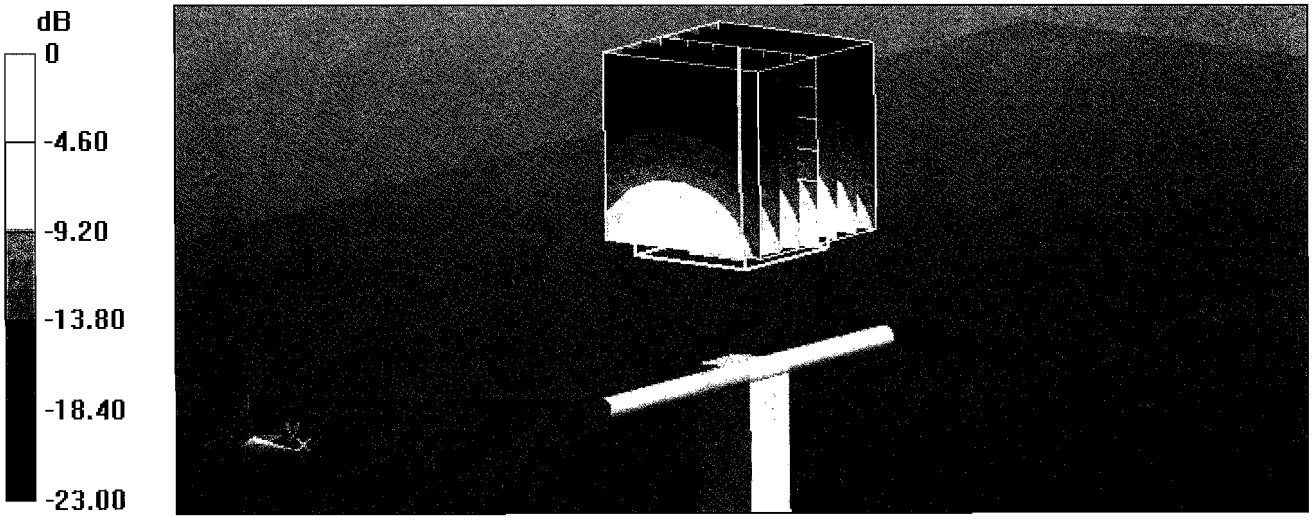
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.84 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

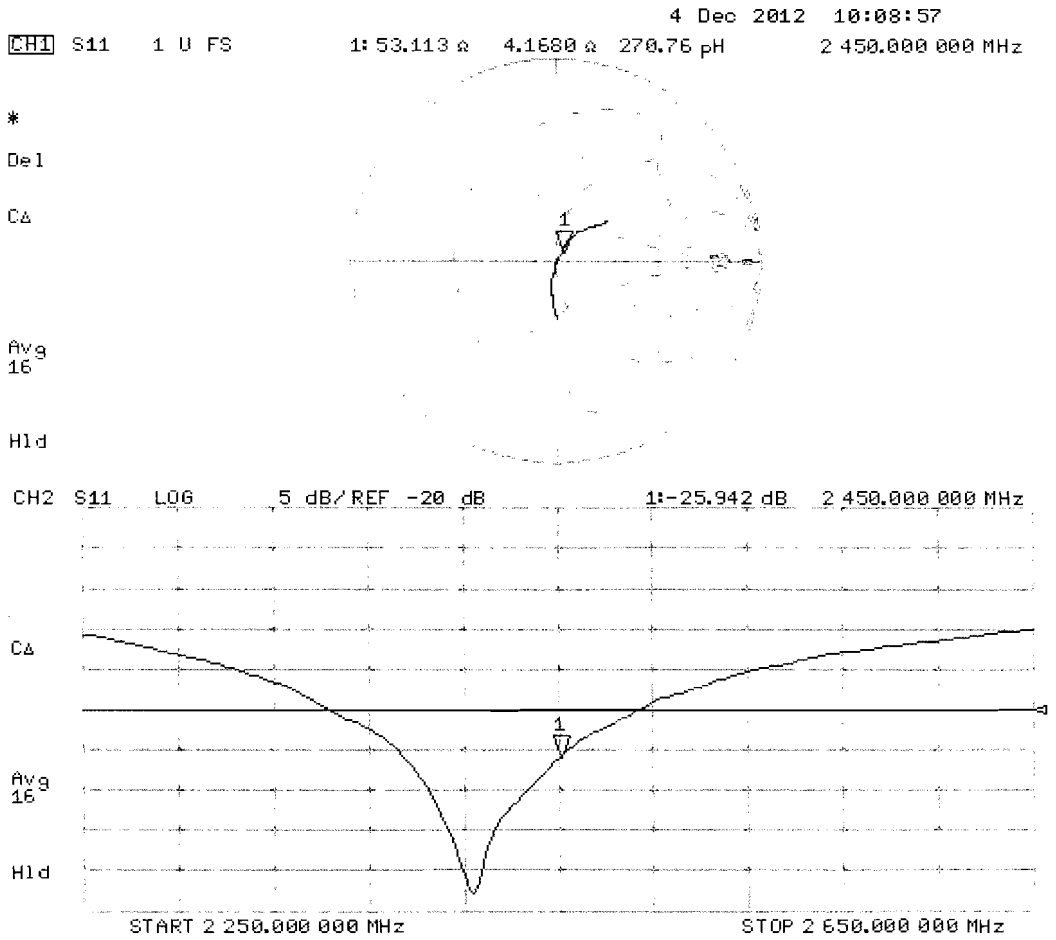
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.1 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 28.3 W/kg
SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.33 W/kg
Maximum value of SAR (measured) = 17.8 W/kg



0 dB = 17.8 W/kg = 12.50 dBW/kg

Impedance Measurement Plot for Head TSL



Date: 04.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 829

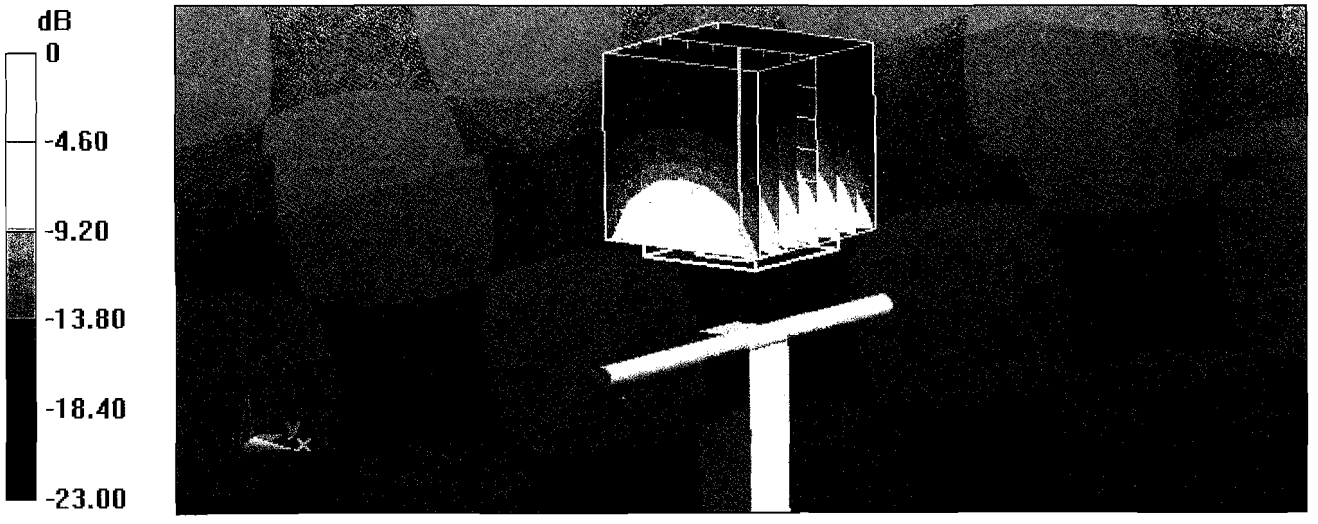
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 mho/m; ε_r = 50.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

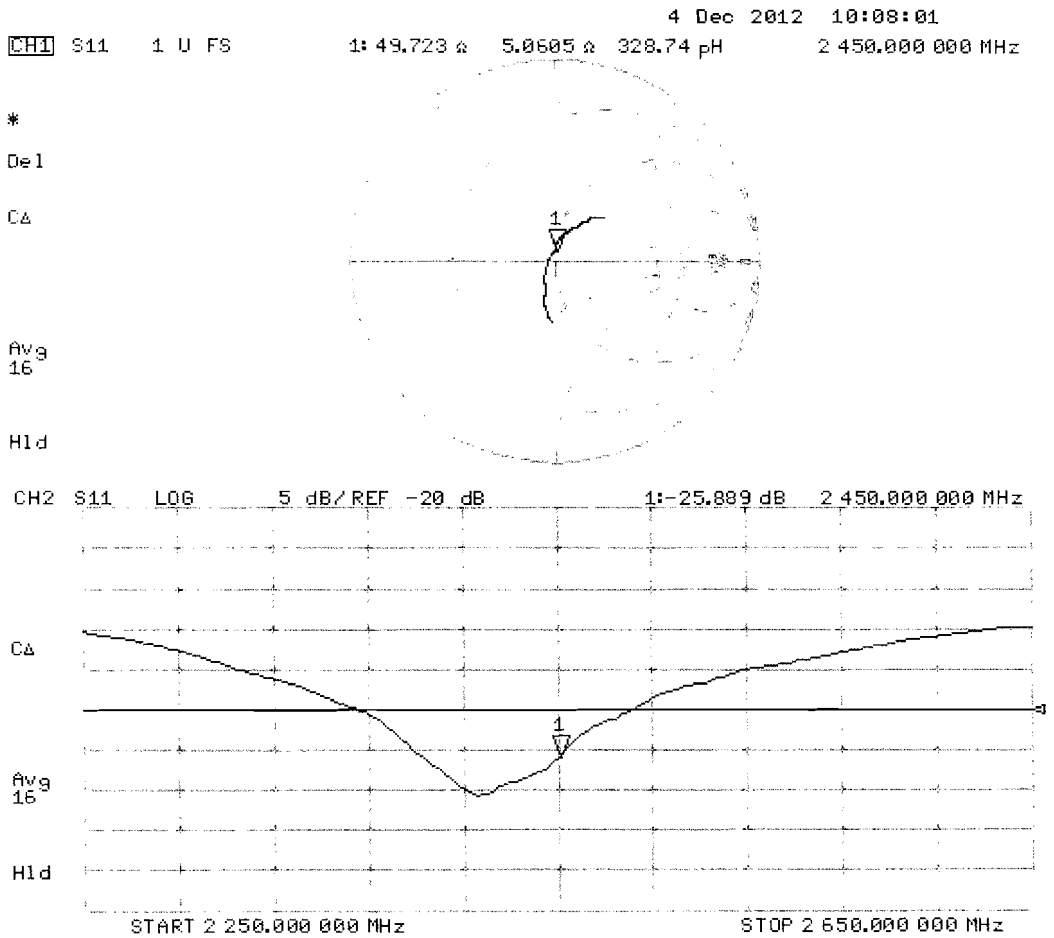
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.1 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.08 W/kg
Maximum value of SAR (measured) = 17.5 W/kg



0 dB = 17.5 W/kg = 12.43 dBW/kg

Impedance Measurement Plot for Body TSL



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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **RF Exposure Lab**

Certificate No: D5GHzV2-1085_Dec12

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1085
Calibration procedure(s)	QA CAL-22.v1 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	December 11, 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 EX3DV4	SN: 3503	30-Dec-11 (No. EX3-3503_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 11, 2012

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

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010

b) 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:

c) 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 V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5300 MHz ± 1 MHz 5600 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.8 ± 6 %	4.53 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.3 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	4.63 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.9 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	4.93 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.69 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**86.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.48 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.5 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.0 ± 6 %	5.15 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	5.35 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.7 ± 6 %	5.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**73.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.7 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	5.86 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.98 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**79.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.9 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	45.9 ± 6 %	6.13 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.36 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**72.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.2 W/kg ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	50.9 Ω - 9.9 jΩ
Return Loss	- 20.2 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	48.7 Ω - 5.6 jΩ
Return Loss	- 24.7 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	56.1 Ω - 4.4 jΩ
Return Loss	- 23.0 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	51.9 Ω - 4.6 jΩ
Return Loss	- 26.2 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	50.0 Ω - 9.5 jΩ
Return Loss	- 20.5 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	49.7 Ω - 5.0 jΩ
Return Loss	- 26.0 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	56.5 Ω - 3.4 jΩ
Return Loss	- 23.2 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	53.5 Ω - 4.7 jΩ
Return Loss	- 25.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.207 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 21, 2009

Date: 11.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1085

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.53 mho/m; ε_r = 34.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 4.63 mho/m; ε_r = 34.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.93 mho/m; ε_r = 34.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.15 mho/m; ε_r = 34; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

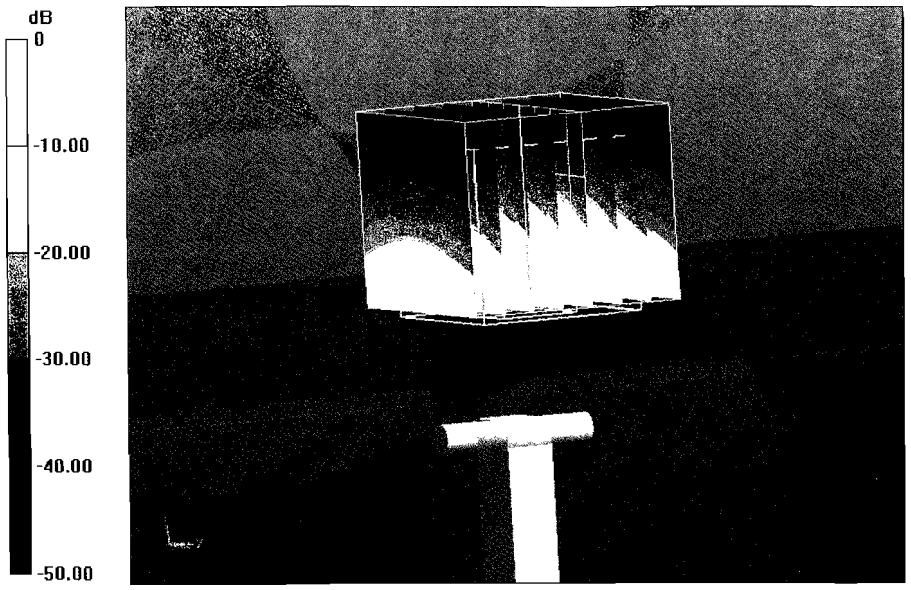
- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 30.12.2011, ConvF(5.1, 5.1, 5.1); Calibrated: 30.12.2011, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2011, ConvF(4.81, 4.81, 4.81); Calibrated: 30.12.2011;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.782 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 30.1 W/kg
SAR(1 g) = 8.2 W/kg; SAR(10 g) = 2.35 W/kg
Maximum value of SAR (measured) = 18.9 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.947 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 31.3 W/kg
SAR(1 g) = 8.35 W/kg; SAR(10 g) = 2.39 W/kg
Maximum value of SAR (measured) = 19.4 W/kg

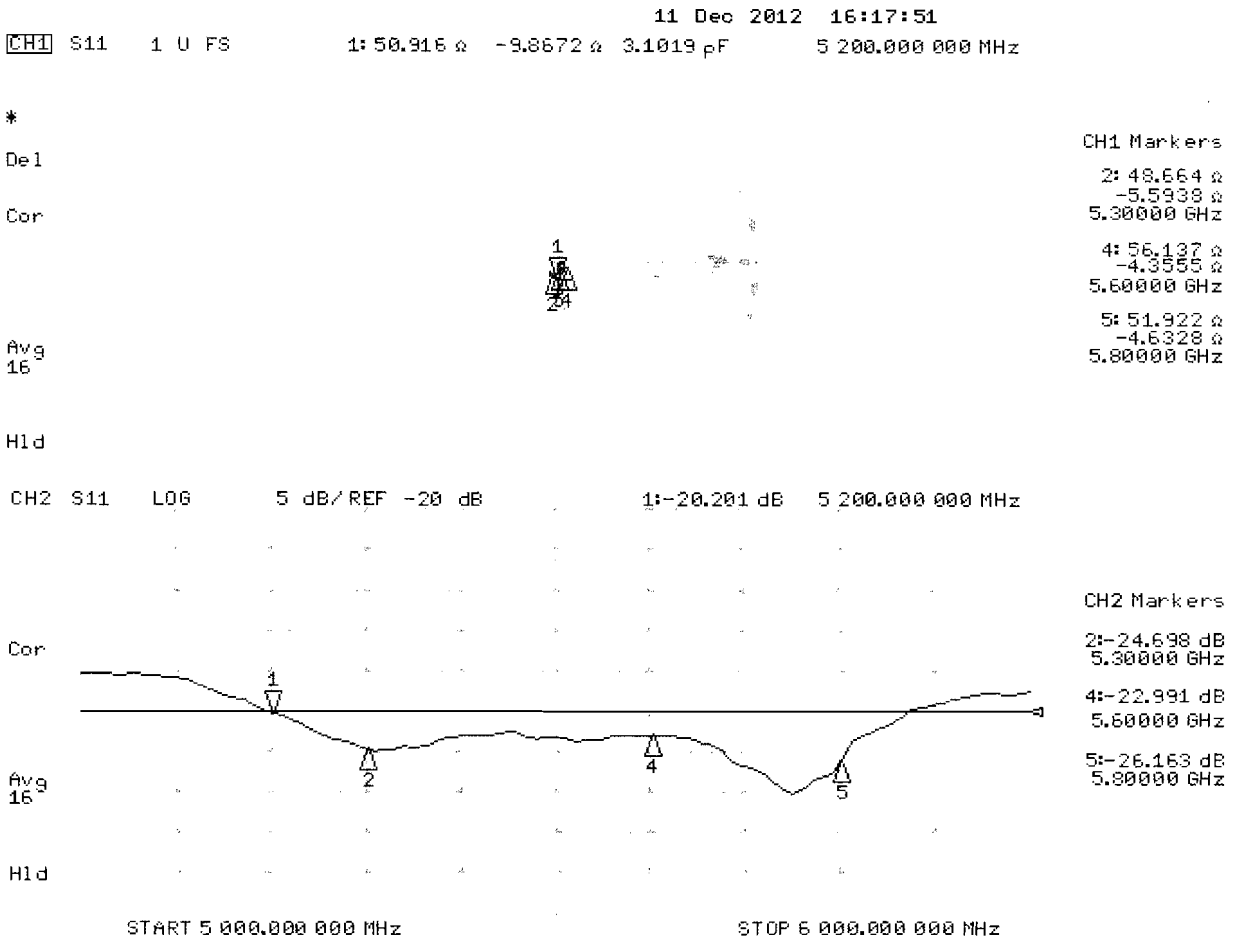
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.857 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 34.4 W/kg
SAR(1 g) = 8.69 W/kg; SAR(10 g) = 2.48 W/kg
Maximum value of SAR (measured) = 20.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 61.816 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 33.5 W/kg
SAR(1 g) = 8.16 W/kg; SAR(10 g) = 2.33 W/kg
Maximum value of SAR (measured) = 19.9 W/kg



0 dB = 19.9 W/kg = 12.99 dBW/kg

Impedance Measurement Plot for Head TSL



Date: 10.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1085

Communication System: CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 5.35 mho/m; ε_r = 46.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5300 MHz; σ = 5.47 mho/m; ε_r = 46.7; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.86 mho/m; ε_r = 46.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.13 mho/m; ε_r = 45.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

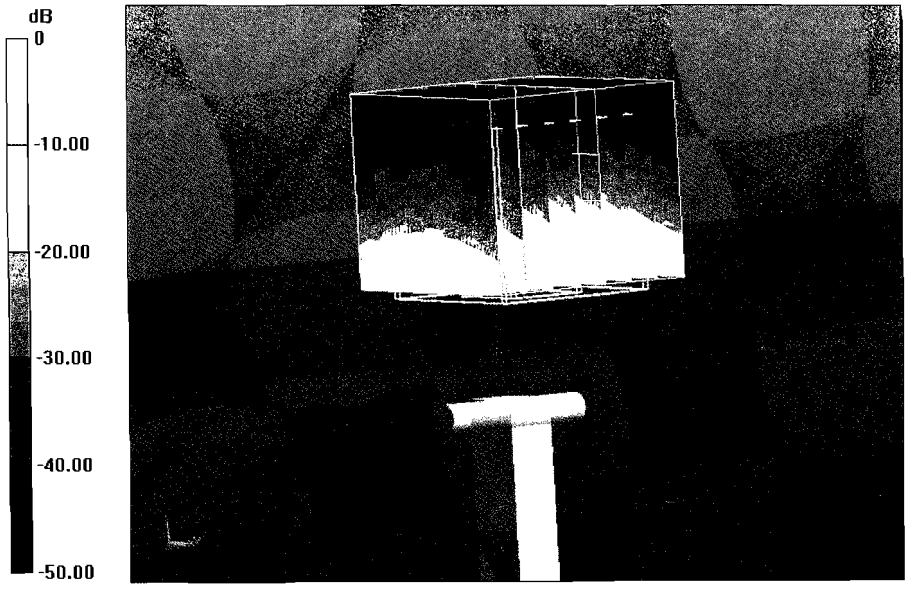
- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2011, ConvF(4.67, 4.67, 4.67); Calibrated: 30.12.2011, ConvF(4.22, 4.22, 4.22); Calibrated: 30.12.2011, ConvF(4.38, 4.38, 4.38); Calibrated: 30.12.2011;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.435 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 29.5 W/kg
SAR(1 g) = 7.41 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 17.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 57.938 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 30.1 W/kg
SAR(1 g) = 7.43 W/kg; SAR(10 g) = 2.09 W/kg
Maximum value of SAR (measured) = 17.4 W/kg

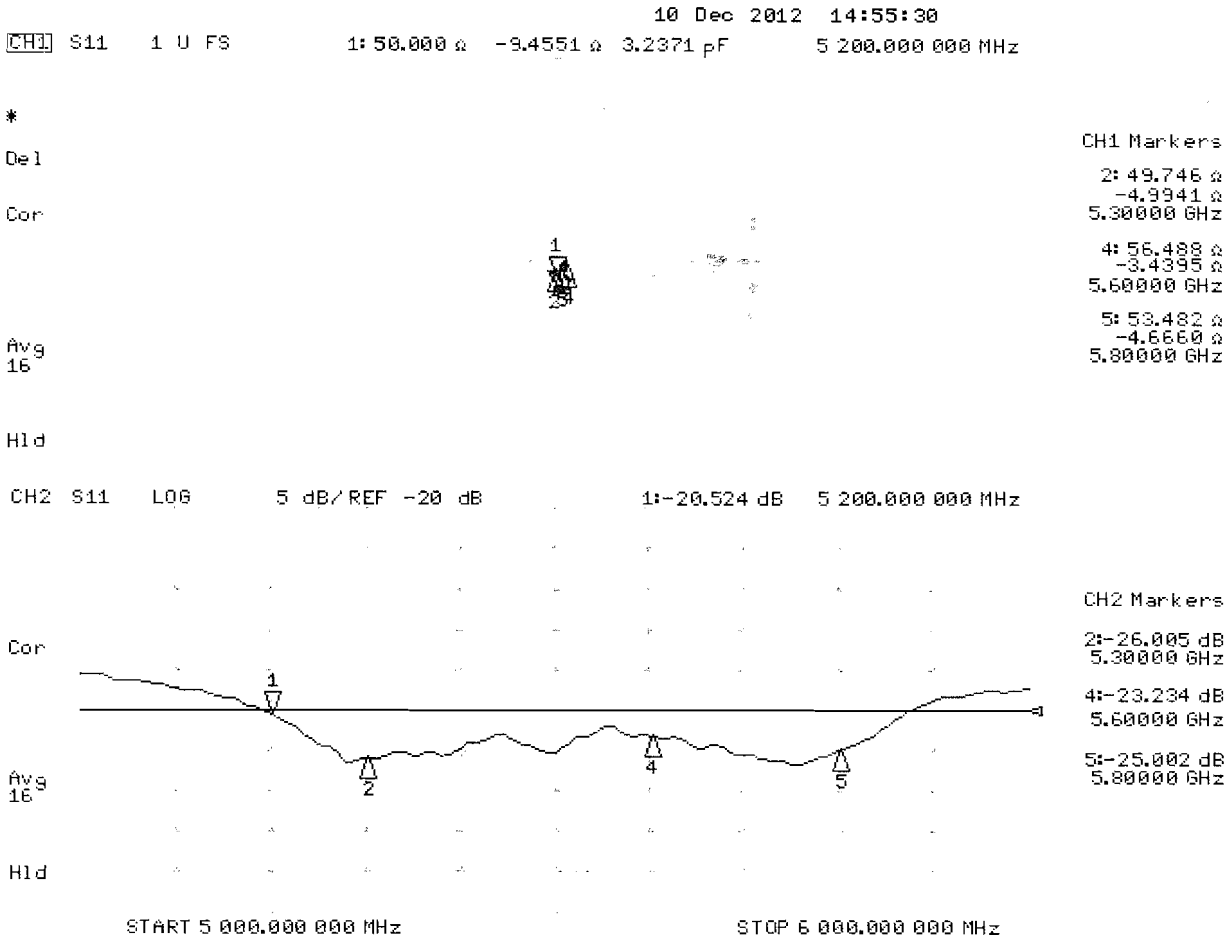
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.467 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 35.4 W/kg
SAR(1 g) = 7.98 W/kg; SAR(10 g) = 2.22 W/kg
Maximum value of SAR (measured) = 19.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 54.901 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 34.6 W/kg
SAR(1 g) = 7.36 W/kg; SAR(10 g) = 2.04 W/kg
Maximum value of SAR (measured) = 18.3 W/kg



0 dB = 18.3 W/kg = 12.62 dBW/kg

Impedance Measurement Plot for Body TSL



Appendix F – Phantom Calibration Data Sheets

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NCL CALIBRATION LABORATORIES

Calibration File No.: RFE-273

CERTIFICATE OF CALIBRATION

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

Thickness of the UniPhantom is 2 mm ± 10%
Pinna thickness is 6 mm ± 10%

Resolution:	0.01 mm	Calibrated to:	0.0 mm
Stability:	OK	Accuracy:	< 0.1 mm

Calibrated By: Karen K. Feb 17/04.

NCL CALIBRATION LABORATORIES

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