RF Exposure Lab

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CERTIFICATE OF COMPLIANCE
SAR EVALUATION

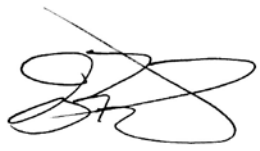
DeLorme		Dates of Test:	March 20, 2013
2 DeLorme Drive		Test Report Number:	SAR.20130301
Yarmouth, ME 04096			Revision B

FCC ID:	UTNINRCH20
Model(s):	INRCH20
Test Sample:	Engineering Unit Same as Production
Serial No.:	Eng 1
Equipment Type:	Location Transceiver
Classification:	Portable Transmitter Next to Body
TX Frequency Range:	1616 MHz – 1626 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	1621 MHz – 34.17 dBm Conducted
Signal Modulation:	BPSK
Antenna Type:	Stub
Application Type:	Certification
FCC Rule Parts:	Part 25
KDB Test Methodology:	KDB 447498 D01 v05
Industry Canada:	RSS-102, Safety Code 6, IEC 62209-2
Max. Stand Alone SAR Value:	0.923 W/kg
Max. Simultaneous SAR Value:	1.046 W/kg
Separation Distance:	0 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. C95.1-1999 and had been tested in accordance with the measurement procedures specified in IEEE 1528-2003, OET Bulletin 65 Supp. C, RSS-102 and Safety Code 6 (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 has been denied 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 DeLorme Model INRCH20 FCC ID: UTNINRCH20 with FCC Part 2, 1093, ET Docket 93-62 Rules for mobile and portable devices. The FCC have adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on August 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC regulated portable devices. [1], [6]

The test results recorded herein are based on a single type test of DeLorme Model INRCH20 and therefore apply only to the tested sample.

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

SAR Definition [5]

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

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

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

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

where:

σ = conductivity of the tissue (S/m)
ρ = mass density of the tissue (kg/m^3)
E = rms electric field strength (V/m)

2. SAR Measurement Setup

Robotic System

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.

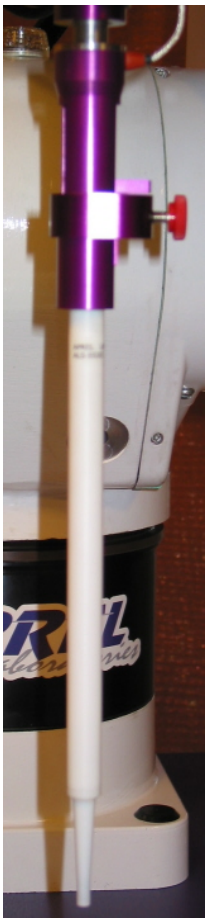
System Description

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.

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



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).

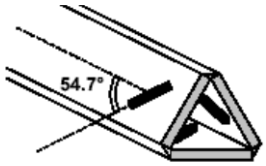
The overall uncertainty for the methodology and algorithms the ALSAS-10-U used during the SAR calculation was evaluated using the data from IEEE 1528 f3 algorithm:

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

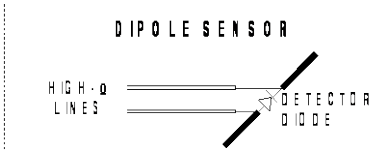
The probe used during the measurement process has been assessed to provide values for diode compression. These values are calculated during the probe calibration exercise and are used in the mathematical calculations for the assessment of SAR.

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.



Δ-BEAM



The SAR is assessed with the probe which moves at a default height of 5mm 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 5mm 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.

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

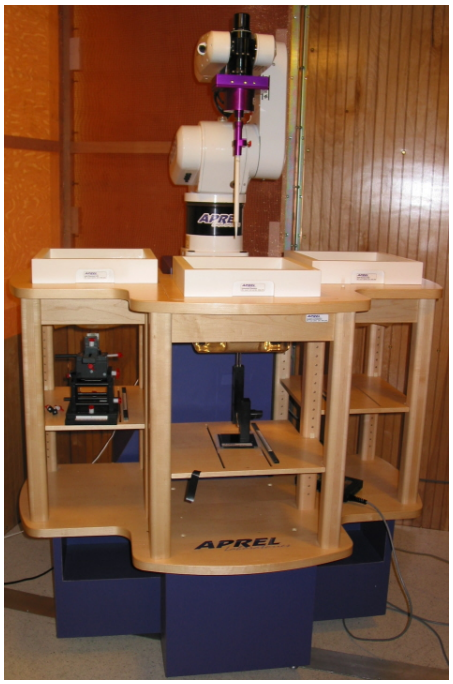
Features:	Signal Amplifier, End Effector, DAC
Software:	ALSAS 10-U Software

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



4. Probe and Dipole Calibration

See Appendix D and E.

5. Phantom & Simulating Tissue Specifications

SAM Phantom

The Aprel system utilizes three separate phantoms. Each phantom for SAR assessment testing is a low loss dielectric shell, with shape and dimensions derived from the anthropomorphic data of the 90th percentile adult male head dimensions as tabulated by the US Army. The SAM phantom shell is bisected along the mid sagittai plane into right and left halves. The perimeter sidewalls of each phantom half is extended to allow filling with liquid to a depth of 15 cm that is sufficient to minimize reflections from the upper surface [5]. See photos in Appendix C.

Head & Body Simulating Mixture Characterization

The head and body mixtures consist of a glycol based chemical and saline solution. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 have been incorporated in the following tables. Other head and 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	
		1640 MHz Body	2450 MHz Body
Mixing Percentage			
Water		54.47	73.20
Sugar		0.00	0.00
Salt		0.33	0.04
HEC		0.00	0.00
Bactericide		0.00	0.00
DGBE		45.22	26.70
Dielectric Constant	Target	53.72	52.70
Conductivity (S/m)	Target	1.42	1.95

Device Holder

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

6. ANSI/IEEE C95.1 – 1999 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] Brain	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.

7. Measurement Uncertainty

Measurement uncertainty table is not required per KDB 865664 D01 v01 section 2.8.2 page 12 when no value is above 1.5 W/kg. The highest reported SAR value is 1.357 W/kg. Therefore, no measurement uncertainty table is required.

8. System Validation

Tissue Verification

Table 8.1 Measured Tissue Parameters

		1640 MHz Body		2450 MHz Body	
Date(s)		Mar. 20, 2013		Apr. 19, 2013	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured
Dielectric Constant: ε		53.72	53.52	52.70	51.68
Conductivity: σ		1.42	1.45	1.95	1.93

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 extrapolated 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)	Deviation (%)
20-Mar-2013	1640 MHz	32.82	33.81	+ 3.02
19-Apr-2013	2450 MHz	51.50	51.79	+ 0.56

See Appendix A for data plots.

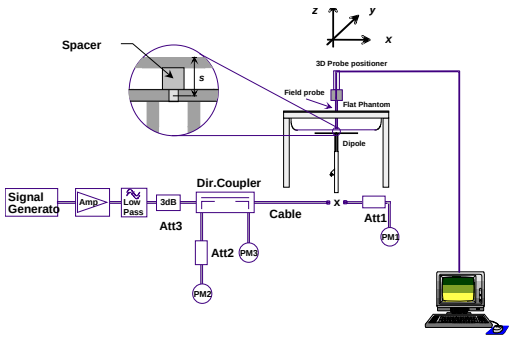


Figure 8.1 Dipole Validation Test Setup

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 placed into simulated transmit mode using the manufacturer's test codes. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR. When test modes are not available or inappropriate for testing a device, 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

The device is battery operated. Each SAR measurement was taken with a fully charged battery. 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 unit was required to be disassembled to measure the conducted power. To insure that the integrity of the device was not compromised, the power measurements were conducted at the completion of all testing.

The total frequency band of the device was 10 MHz. Per KDB 447498 D01 v05 section 4.1 6) on page 7, there is only one channel required to be tested.

N_c = Round $\{[100(f_{high} - f_{low})/f_c]^{0.5} \times (f_c/100)^{0.2}\}$ = Round $\{[100(1626 - 1616)/1621]^{0.5} \times (1621/100)^{0.2} = 1$

The testing was conducted on the front and back of the device. The transmitter is controlled by the firmware to limit the duty cycle. The highest rate at which a user can transmit messages using the device is once every sixteen seconds. Each transmission cycle consists of four 1.36 second transmit bursts for a total transmitter on time of 5.44 seconds every 16 seconds (34% duty cycle). All measurements were conducted with the transmitter at 50% duty cycle for the SAR tests as this was the maximum value achievable. The final SAR value was calculated with the 34% duty cycle of the transmitter in normal use.

Bluetooth operation was evaluated as the power level of the BT transmitter was higher than the excluded limit per KDB 447498. The Bluetooth transmitter does simultaneously transmit with the 1621 MHz transmitter. The simultaneous transmit is evaluated on page 18.

1621 MHz		
Freq	**Channel**	**Power**
1621	120	34.17

Conduct Power Measurements

SAR Data Summary – 1621 MHz Body

MEASUREMENT RESULTS							
Gap	**Side**	**Frequency MHz**	**Modulation**	**End Power (dBm)**	**Battery**	**Measured SAR (W/kg)**	**SAR (W/kg) 34% Duty Cycle**
0 mm	Front	1621	BPSK	34.17	Standard	1.307	0.889
	Back	1621	BPSK	34.17	Standard	0.868	0.590
	Left Side	1621	BPSK	34.17	Standard	0.653	0.444
	Right Side	1621	BPSK	34.17	Standard	0.141	0.096
	Front	1621	BPSK	34.17	Standard	1.357	0.923

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

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Uniphantom ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

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SAR Data Summary – 2450 MHz Body

MEASUREMENT RESULTS						
Gap	**Side**	**Frequency MHz**	**Modulation**	**End Power (dBm)**	**Battery**	**Measured SAR (W/kg)**
0 mm	Front	2440	GFSK	10.41	Standard	0.123
	Back	2440	GFSK	10.41	Standard	0.103
	Left Side	2440	GFSK	10.41	Standard	0.106

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

1. SAR Measurement
   Phantom Configuration ☐Left Head ☒Uniphantom ☐Right Head
   SAR Configuration ☐Head ☒Body
2. Test Signal Call Mode ☒Test Code ☐Base Station Simulator
3. Test Configuration ☐With Belt Clip ☐Without Belt Clip ☒N/A
4. Tissue Depth is at least 15.0 cm

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Vice President

Simultaneous Transmit Evaluation

Side	1640 MHz SAR	2450 MHz SAR	Simultaneous SAR Sum
Front	0.923	0.123	1.046
Back	0.590	0.103	0.693
Left Side	0.444	0.106	0.550

The sum of the two SAR values is less than the limit of 1.6 W/kg; therefore, the simultaneous transmit meets the requirements of KDB 447498 D01 v05.

10. Test Equipment List

Table 10.1 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 Dummy Probe	N/A	N/A	023
Aprel Uni-Phantom	N/A	N/A	RFE-269
Aprel Validation Dipole ALS-D-1640-S-2	01/16/2014	01/16/2013	207-00101
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 (1640 MHz)	N/A	N/A	N/A
Body Equivalent Matter (2450 MHz)	N/A	N/A	N/A

11. 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. [3]

12. 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 – 1999, 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 – 2002, 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, July 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), November 2005.

[7] Industry Canada, Safety Code 6, Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3kHz to 300 GHz, 1999.

Appendix A – System Validation Plots and Data

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**********************************************************
Test Result for UIM Dielectric Parameter
Wed 20/Mar/2013 08:26:29
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
1.6100	53.80	1.40	53.62	1.42
1.6200	53.77	1.41	53.58	1.43
1.6210	53.768	1.41	53.578	1.431*
1.6300	53.75	1.41	53.56	1.44
1.6400	53.72	1.42	53.52	1.45
1.6500	53.69	1.43	53.58	1.46
1.6600	53.67	1.43	53.56	1.47
1.6700	53.64	1.44	53.52	1.48

* value interpolated

```
**********************************************************
Test Result for UIM Dielectric Parameter
Fri 19/Apr/2013 07:54:39
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
2.3900	52.78	1.89	51.83	1.87
2.4000	52.77	1.90	51.81	1.87
2.4100	52.75	1.91	51.79	1.88
2.4200	52.74	1.92	51.76	1.89
2.4300	52.73	1.93	51.74	1.90
2.4400	52.71	1.94	51.70	1.92
2.4500	52.70	1.95	51.68	1.93
2.4600	52.69	1.96	51.65	1.94
2.4700	52.67	1.98	51.62	1.95
2.4800	52.66	1.99	51.59	1.96

SAR Test Report

By Operator : Jay
Measurement Date : 20-Mar-2013
Starting Time : 20-Mar-2013 08:36:30 AM
End Time : 20-Mar-2013 08:49:59 AM
Scanning Time : 809 secs

Product Data
Device Name : Validation
Serial No. : 1640
Type : Dipole
Model : ALS-D-1640-S-2
Frequency : 1640.00 MHz
Max. Transmit Pwr : 0.1 W
Drift Time : 0 min(s)
Length : 80.4 mm
Width : 3.6 mm
Depth : 45.7 mm
Antenna Type : Internal
Orientation : Touch
Power Drift-Start : 4.433 W/kg
Power Drift-Finish: 4.485 W/kg
Power Drift (%) : 1.176

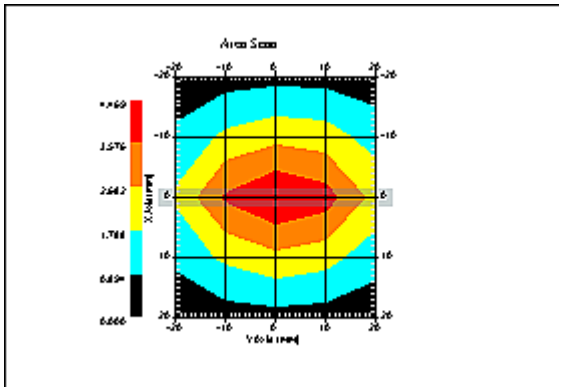
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 1640
Frequency : 1640.00 MHz
Last Calib. Date : 20-Mar-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 49.00 RH%
Epsilon : 53.52 F/m
Sigma : 1.45 S/m
Density : 1000.00 kg/cu. m

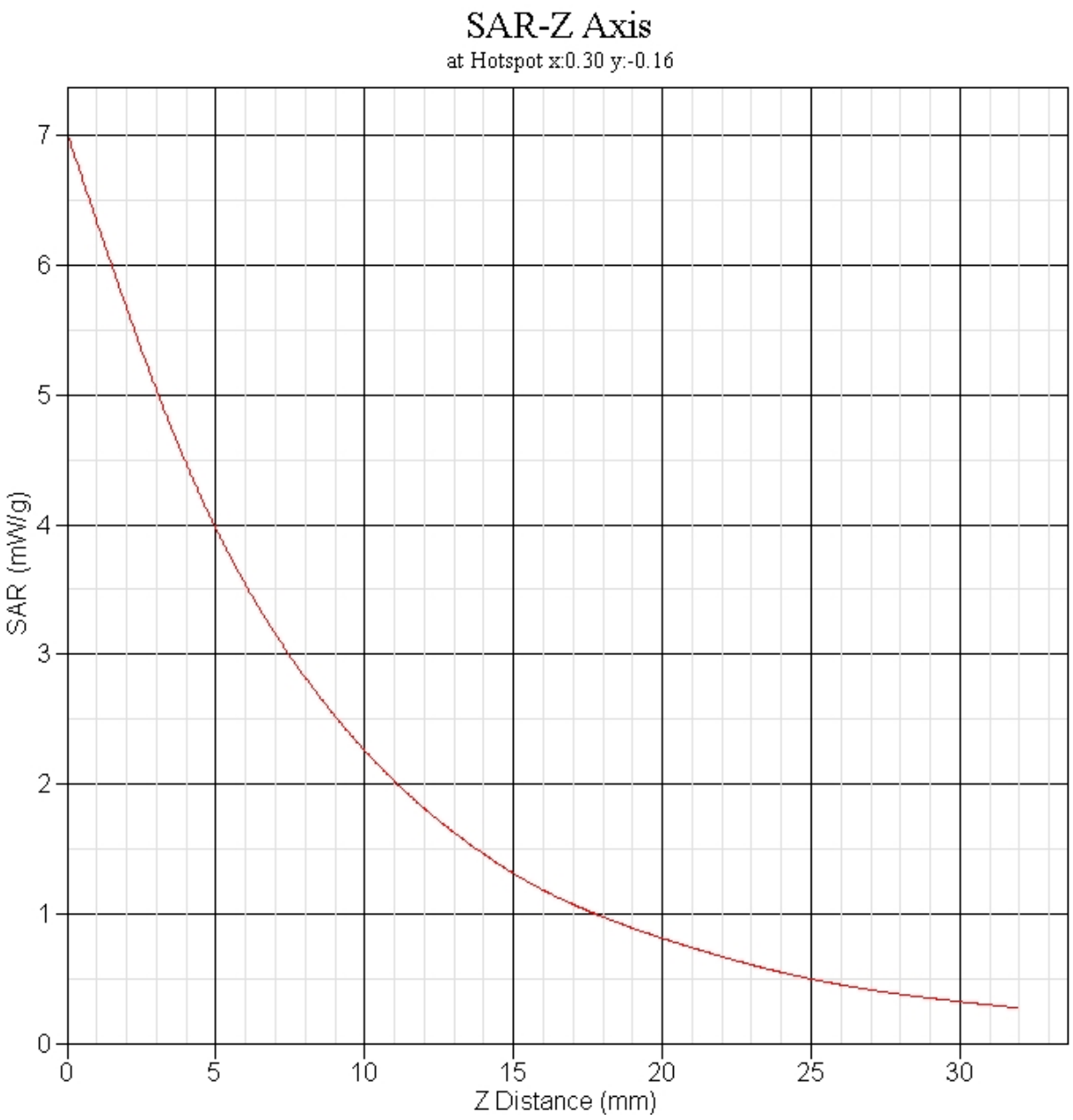
Probe Data
Name : Probe 215 - RFEL
Model : E020
Type : E-Field Triangle
Serial No. : 215
Last Calib. Date : 23-Aug-2012
Frequency : 1640.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.56 mm

```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 20-Mar-2013
Set-up Time       : 7:04:12 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    : 3.381 W/kg
10 gram SAR value   : 1.799 W/kg
Area Scan Peak SAR  : 4.069 W/kg
Zoom Scan Peak SAR  : 7.026 W/kg
```



SAR Test Report

By Operator : Jay
Measurement Date : 19-Apr-2013
Starting Time : 19-Apr-2013 08:09:13 AM
End Time : 19-Apr-2013 08:22:07 AM
Scanning Time : 774 secs

Product Data
Device Name : Validation
Serial No. : 2450
Type : Dipole
Model : ALS-D-2450-S-2
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 : 6.215 W/kg
Power Drift-Finish: 6.280 W/kg
Power Drift (%) : 1.050

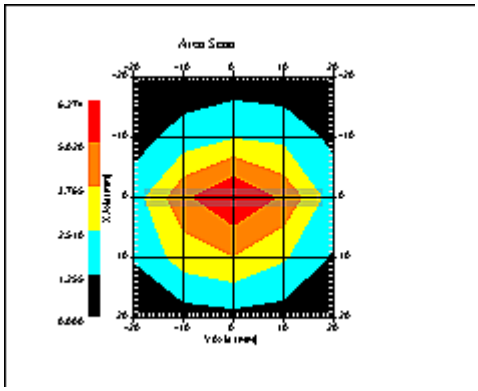
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 2450
Frequency : 2450.00 MHz
Last Calib. Date : 19-Apr-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 51.68 F/m
Sigma : 1.93 S/m
Density : 1000.00 kg/cu. m

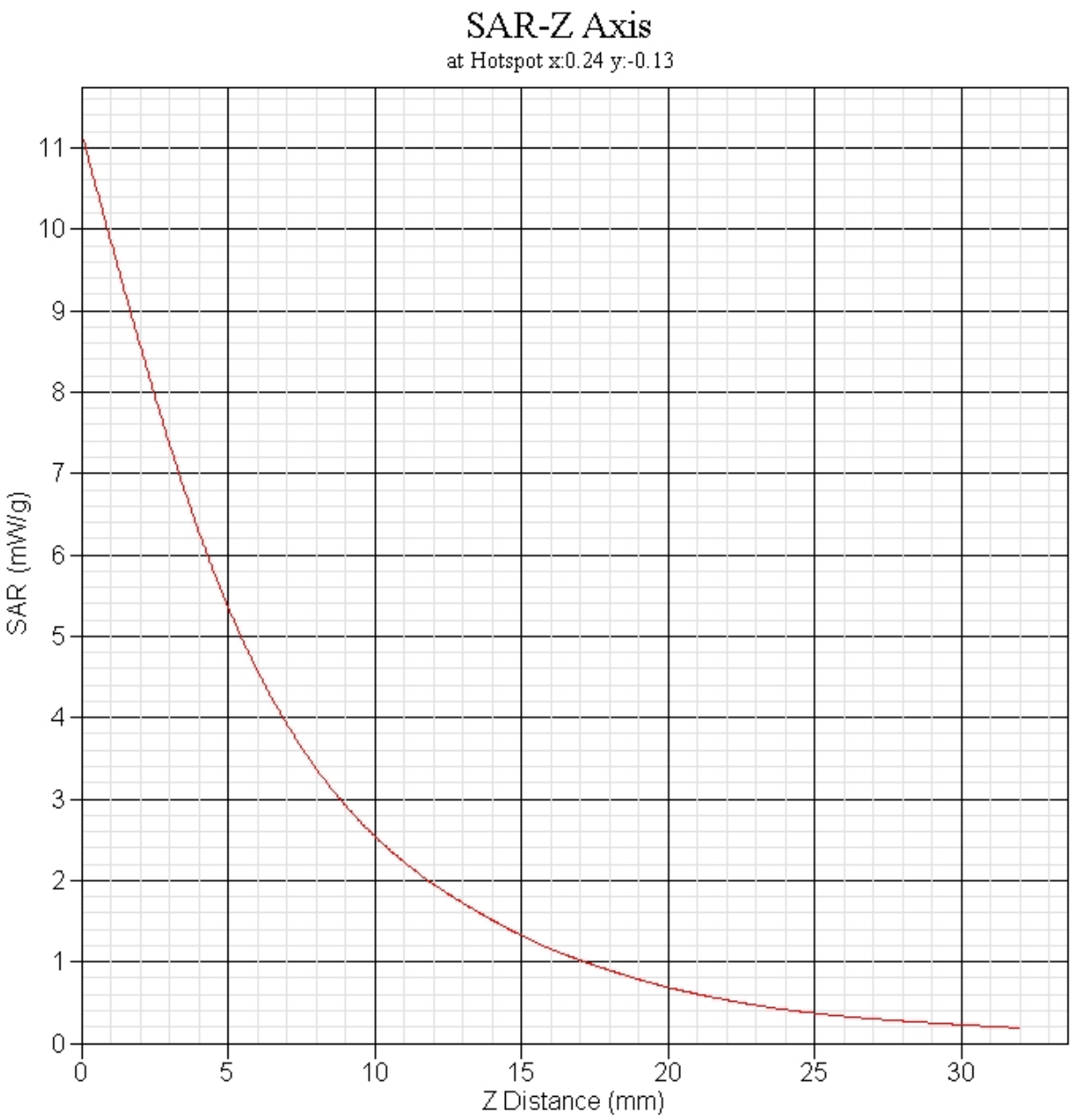
Probe Data
Name : Probe 215 - RFEL
Model : E020
Type : E-Field Triangle
Serial No. : 215
Last Calib. Date : 23-Aug-2012
Frequency : 2450.00 MHz
Duty Cycle Factor: 1
Conversion Factor: 3.94
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.56 mm

```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 19-Apr-2013
Set-up Time       : 7:40:13 AM
Area Scan         : 5x5x1 : Measurement x=10mm, y=10mm, z=4mm
Zoom Scan         : 7x7x8 : Measurement x=5mm, y=5mm, z=4mm

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



```
1 gram SAR value    : 5.179 W/kg
10 gram SAR value   : 2.402 W/kg
Area Scan Peak SAR  : 6.274 W/kg
Zoom Scan Peak SAR  : 11.190 W/kg
```



Appendix B – SAR Test Data Plots

SAR Test Report

By Operator : Jay
Measurement Date : 20-Mar-2013
Starting Time : 20-Mar-2013 09:40:25 AM
End Time : 20-Mar-2013 10:08:33 AM
Scanning Time : 1688 secs

Product Data
Device Name : Delorme
Serial No. : Eng 1
Mode : Satellite
Model : inReach SE
Frequency : 1621.00 MHz
Max. Transmit Pwr : 1.384 W
Drift Time : 0 min(s)
Length : 144 mm
Width : 60 mm
Depth : 30 mm
Antenna Type : Stub
Orientation : Front
Power Drift-Start : 0.208 W/kg
Power Drift-Finish: 0.205 W/kg
Power Drift (%) : -1.446

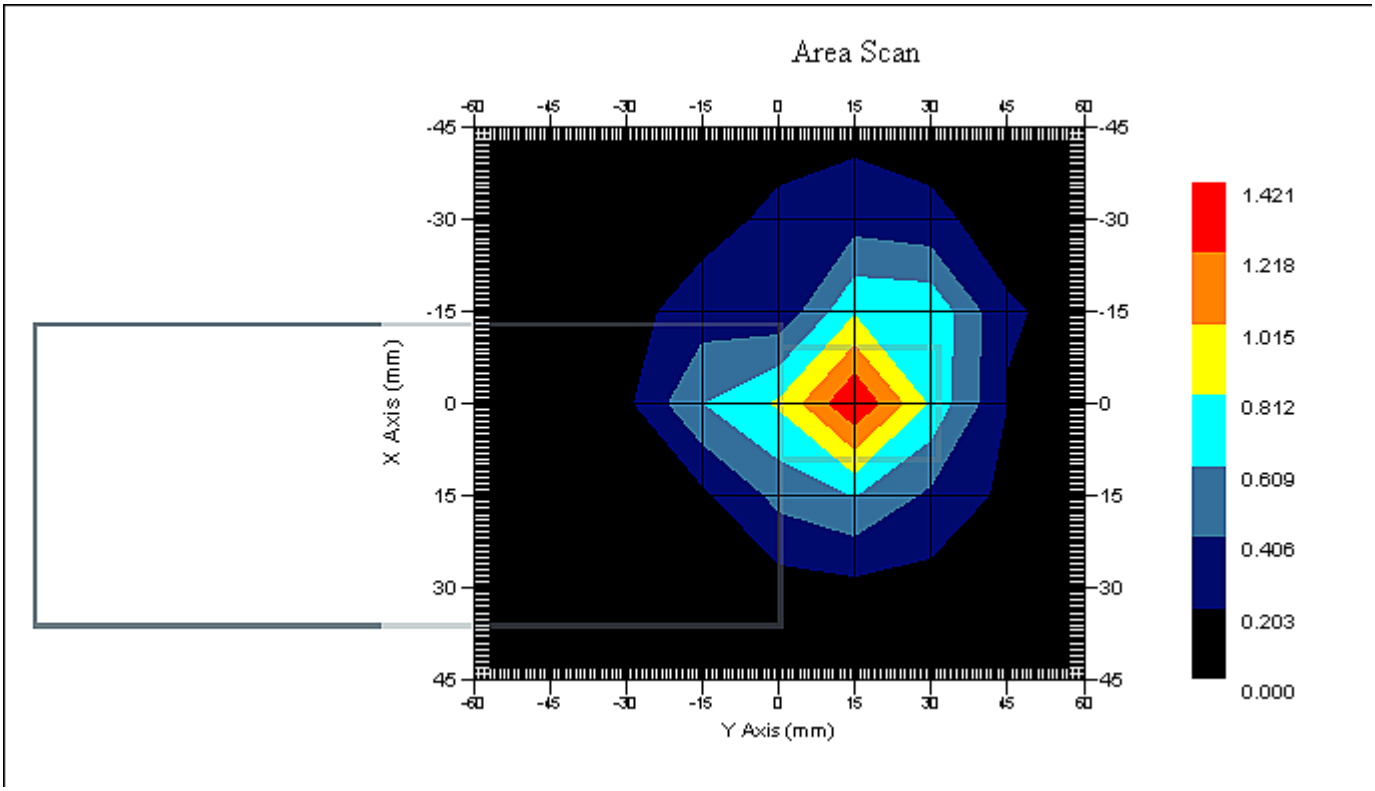
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 1621
Frequency : 1621.00 MHz
Last Calib. Date : 20-Mar-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 53.578 F/m
Sigma : 1.431 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 : 1640.00 MHz
Duty Cycle Factor: 2
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.56 mm

```
Measurement Data
Crest Factor      : 2
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 20-Mar-2013
Set-up Time       : 9:13:37 AM
Area Scan         : 7x9x1 : Measurement x=15mm, y=15mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Front
Separation        : 0 mm
Channel           : Mid
```




```
1 gram SAR value    : 1.307 W/kg
10 gram SAR value   : 0.742 W/kg
Area Scan Peak SAR  : 1.418 W/kg
Zoom Scan Peak SAR  : 2.162 W/kg
```

SAR Test Report

By Operator : Jay
Measurement Date : 20-Mar-2013
Starting Time : 20-Mar-2013 10:10:31 AM
End Time : 20-Mar-2013 10:38:31 AM
Scanning Time : 1680 secs

Product Data
Device Name : Delorme
Serial No. : Eng 1
Mode : Satellite
Model : inReach SE
Frequency : 1621.00 MHz
Max. Transmit Pwr : 1.384 W
Drift Time : 0 min(s)
Length : 144 mm
Width : 60 mm
Depth : 30 mm
Antenna Type : Stub
Orientation : Back
Power Drift-Start : 0.186 W/kg
Power Drift-Finish: 0.192 W/kg
Power Drift (%) : 3.347

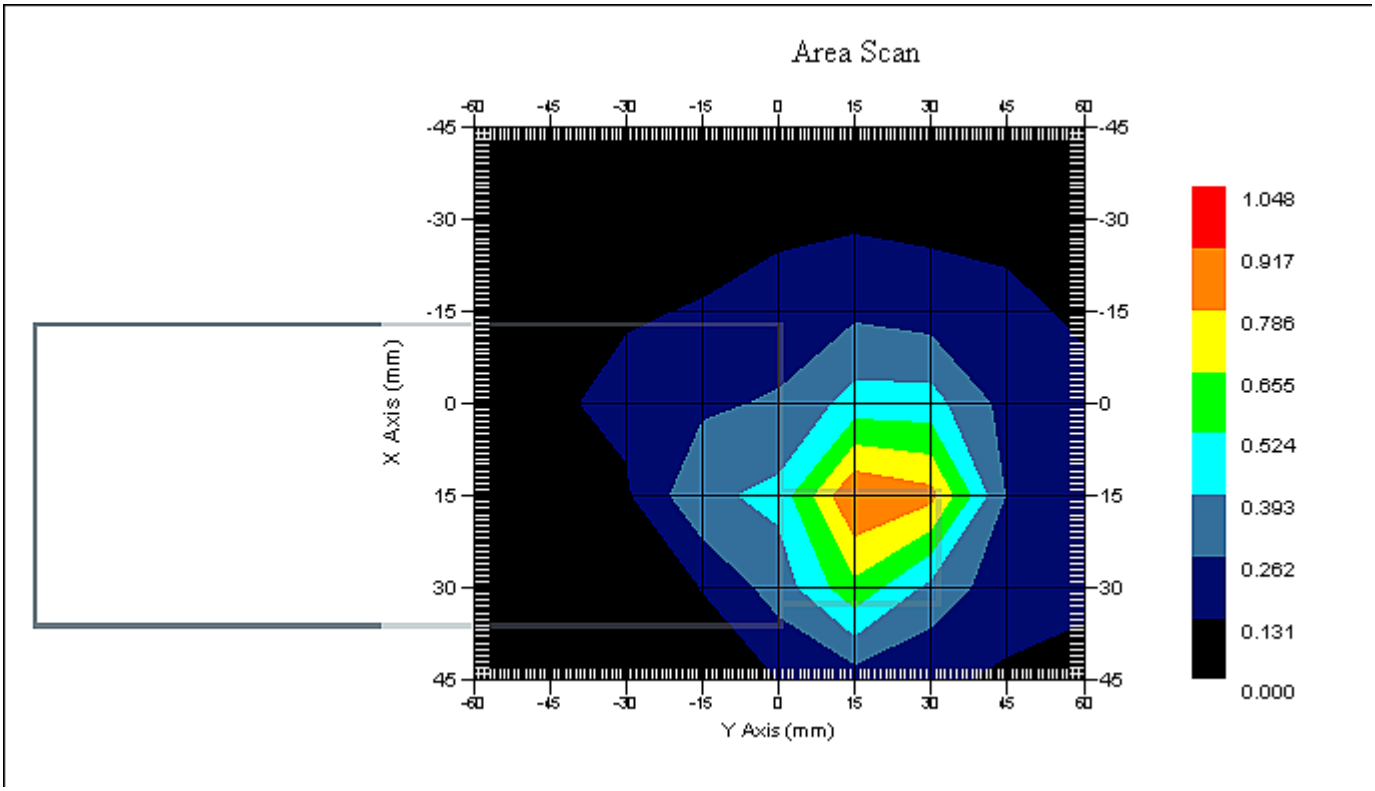
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 1621
Frequency : 1621.00 MHz
Last Calib. Date : 20-Mar-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 53.58 F/m
Sigma : 1.43 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 : 1640.00 MHz
Duty Cycle Factor: 2
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.56 mm

```
Measurement Data
Crest Factor      : 2
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 20-Mar-2013
Set-up Time       : 9:13:37 AM
Area Scan         : 7x9x1 : Measurement x=15mm, y=15mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Back
Separation        : 0 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.868 W/kg
10 gram SAR value   : 0.505 W/kg
Area Scan Peak SAR  : 0.920 W/kg
Zoom Scan Peak SAR  : 1.151 W/kg
```

SAR Test Report

By Operator : Jay
Measurement Date : 20-Mar-2013
Starting Time : 20-Mar-2013 11:20:03 AM
End Time : 20-Mar-2013 11:47:49 AM
Scanning Time : 1666 secs

Product Data
Device Name : Delorme
Serial No. : Eng 1
Mode : Satellite
Model : inReach SE
Frequency : 1621.00 MHz
Max. Transmit Pwr : 1.384 W
Drift Time : 0 min(s)
Length : 144 mm
Width : 30 mm
Depth : 60 mm
Antenna Type : Stub
Orientation : Left Side
Power Drift-Start : 0.300 W/kg
Power Drift-Finish: 0.293 W/kg
Power Drift (%) : -2.590

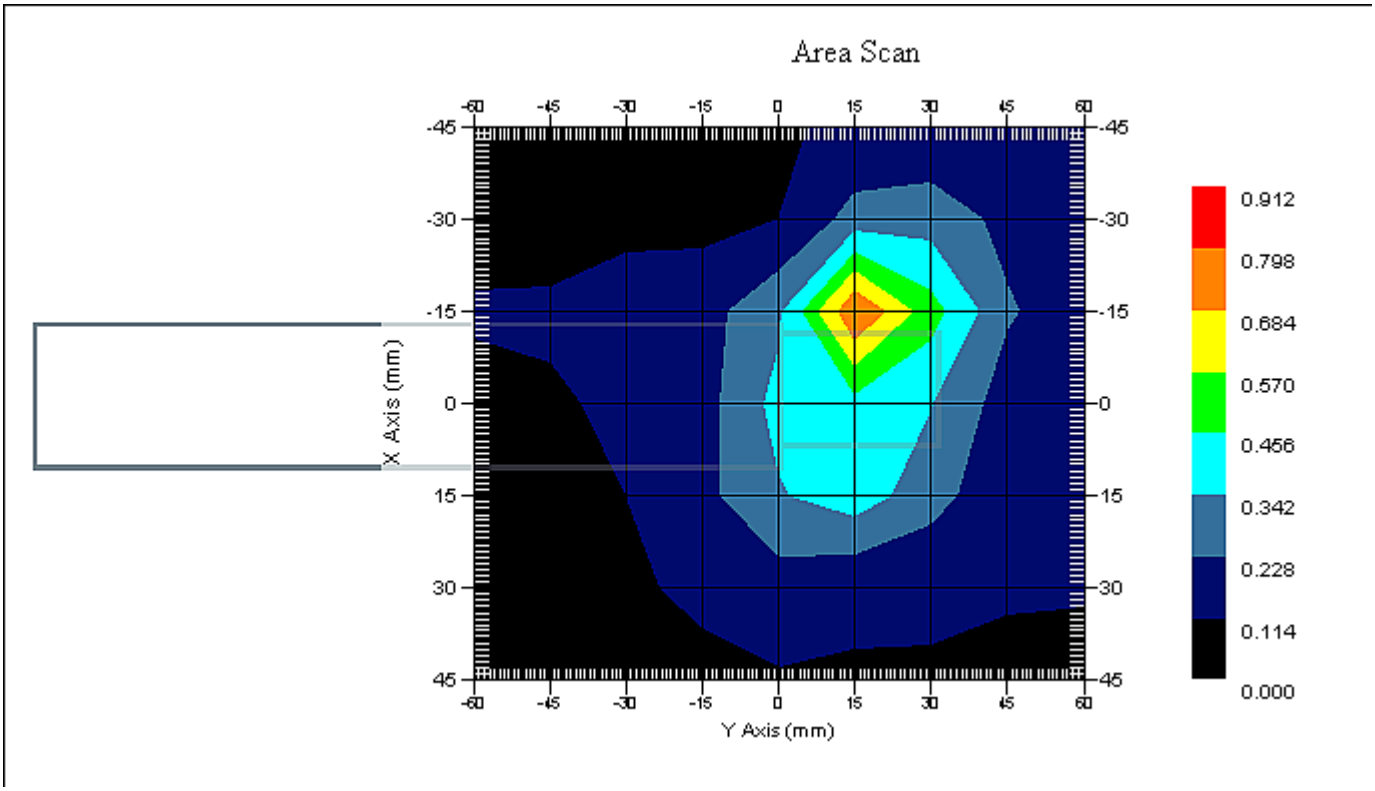
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 1621
Frequency : 1621.00 MHz
Last Calib. Date : 20-Mar-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 53.58 F/m
Sigma : 1.43 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 : 1640.00 MHz
Duty Cycle Factor: 2
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.56 mm

```
Measurement Data
Crest Factor      : 2
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 20-Mar-2013
Set-up Time       : 9:13:37 AM
Area Scan         : 7x9x1 : Measurement x=15mm, y=15mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Left Side
Separation        : 0 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.653 W/kg
10 gram SAR value   : 0.394 W/kg
Area Scan Peak SAR  : 0.800 W/kg
Zoom Scan Peak SAR  : 1.030 W/kg
```

SAR Test Report

By Operator : Jay
Measurement Date : 20-Mar-2013
Starting Time : 20-Mar-2013 12:07:23 PM
End Time : 20-Mar-2013 12:34:56 PM
Scanning Time : 1653 secs

Product Data
Device Name : Delorme
Serial No. : Eng 1
Mode : Satellite
Model : inReach SE
Frequency : 1621.00 MHz
Max. Transmit Pwr : 1.384 W
Drift Time : 0 min(s)
Length : 144 mm
Width : 30 mm
Depth : 60 mm
Antenna Type : Stub
Orientation : Right Side
Power Drift-Start : 0.096 W/kg
Power Drift-Finish: 0.098 W/kg
Power Drift (%) : 1.837

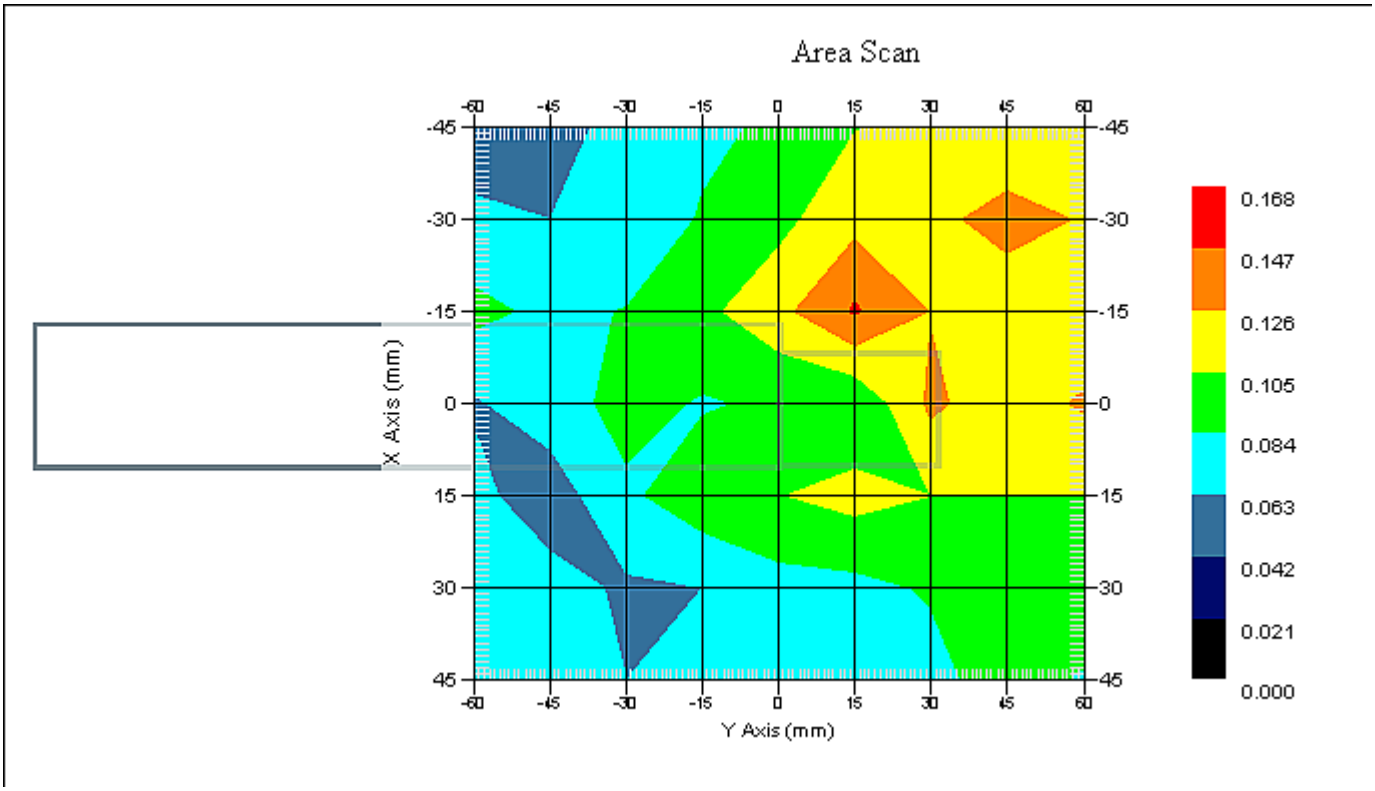
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 1621
Frequency : 1621.00 MHz
Last Calib. Date : 20-Mar-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 53.58 F/m
Sigma : 1.43 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 : 1640.00 MHz
Duty Cycle Factor: 2
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.56 mm

```
Measurement Data
Crest Factor      : 2
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 20-Mar-2013
Set-up Time       : 12:07:18 PM
Area Scan         : 7x9x1 : Measurement x=15mm, y=15mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Right Side
Separation        : 0 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.141 W/kg
10 gram SAR value   : 0.118 W/kg
Area Scan Peak SAR  : 0.150 W/kg
Zoom Scan Peak SAR  : 0.160 W/kg
```

SAR Test Report

By Operator : Jay
Measurement Date : 20-Mar-2013
Starting Time : 20-Mar-2013 12:37:03 PM
End Time : 20-Mar-2013 01:04:48 PM
Scanning Time : 1665 secs

Product Data
Device Name : Delorme
Serial No. : Eng 1
Mode : Satellite
Model : inReach SE
Frequency : 1621.00 MHz
Max. Transmit Pwr : 1.384 W
Drift Time : 0 min(s)
Length : 144 mm
Width : 60 mm
Depth : 30 mm
Antenna Type : Stub
Orientation : Front - Repeated
Power Drift-Start : 0.242 W/kg
Power Drift-Finish: 0.249 W/kg
Power Drift (%) : 3.048

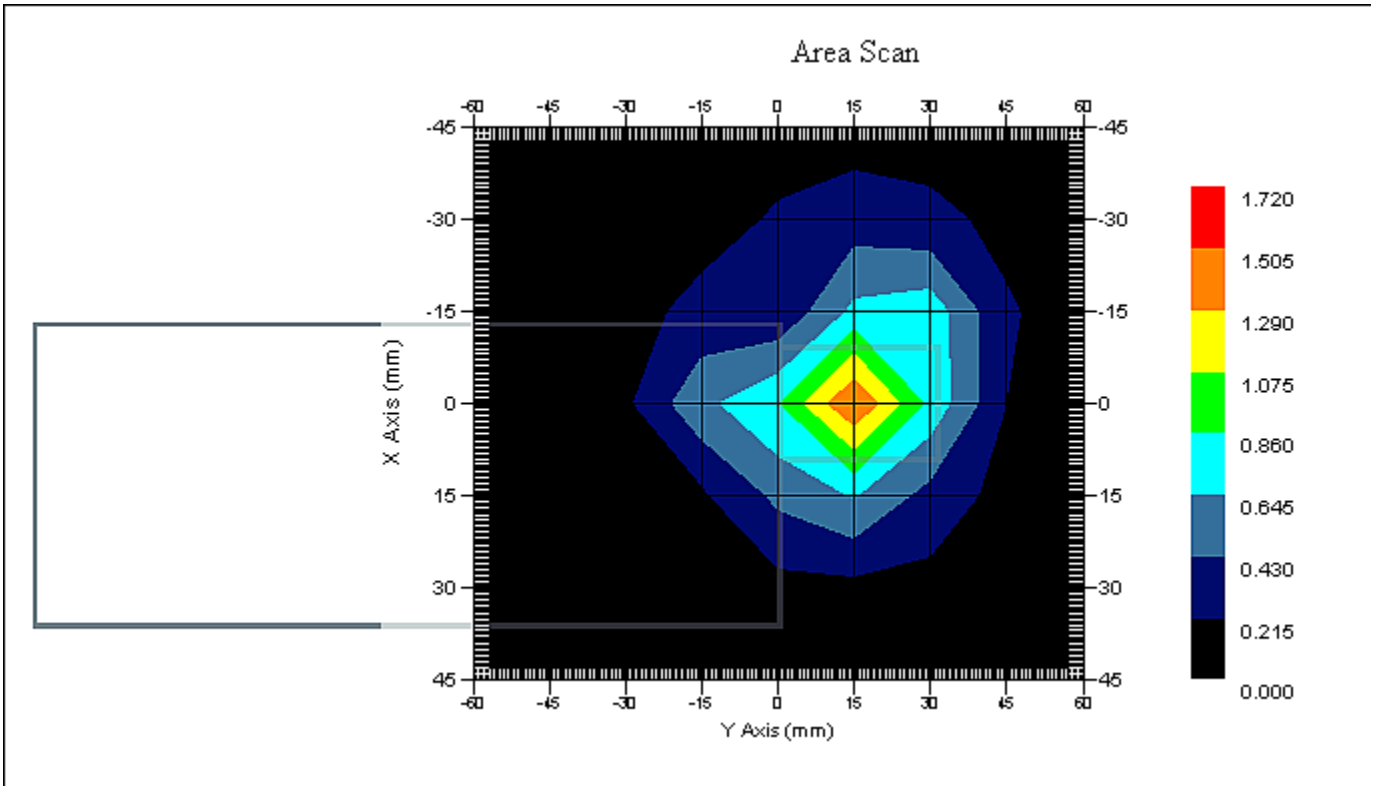
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 1621
Frequency : 1621.00 MHz
Last Calib. Date : 20-Mar-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 53.578 F/m
Sigma : 1.431 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 : 1640.00 MHz
Duty Cycle Factor: 2
Conversion Factor: 5
Probe Sensitivity: 1.20 1.20 1.20 $\mu V/(V/m)^2$
Compression Point: 95.00 mV
Offset : 1.56 mm

```
Measurement Data
Crest Factor      : 2
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 20-Mar-2013
Set-up Time       : 12:07:18 PM
Area Scan         : 7x9x1 : Measurement x=15mm, y=15mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Front
Separation        : 0 mm
Channel           : Mid
```




```
1 gram SAR value    : 1.357 W/kg
10 gram SAR value   : 0.758 W/kg
Area Scan Peak SAR  : 1.508 W/kg
Zoom Scan Peak SAR  : 2.662 W/kg
```

SAR Test Report

By Operator : Jay
Measurement Date : 19-Apr-2013
Starting Time : 19-Apr-2013 08:59:05 AM
End Time : 19-Apr-2013 09:21:48 AM
Scanning Time : 1363 secs

Product Data
Device Name : Delorme
Serial No. : Eng 1
Mode : Bluetooth
Model : inReach SE
Frequency : 2440.00 MHz
Max. Transmit Pwr : 0.011 W
Drift Time : 0 min(s)
Length : 112 mm
Width : 60 mm
Depth : 30 mm
Antenna Type : Internal
Orientation : Front
Power Drift-Start : 0.099 W/kg
Power Drift-Finish: 0.100 W/kg
Power Drift (%) : 0.428

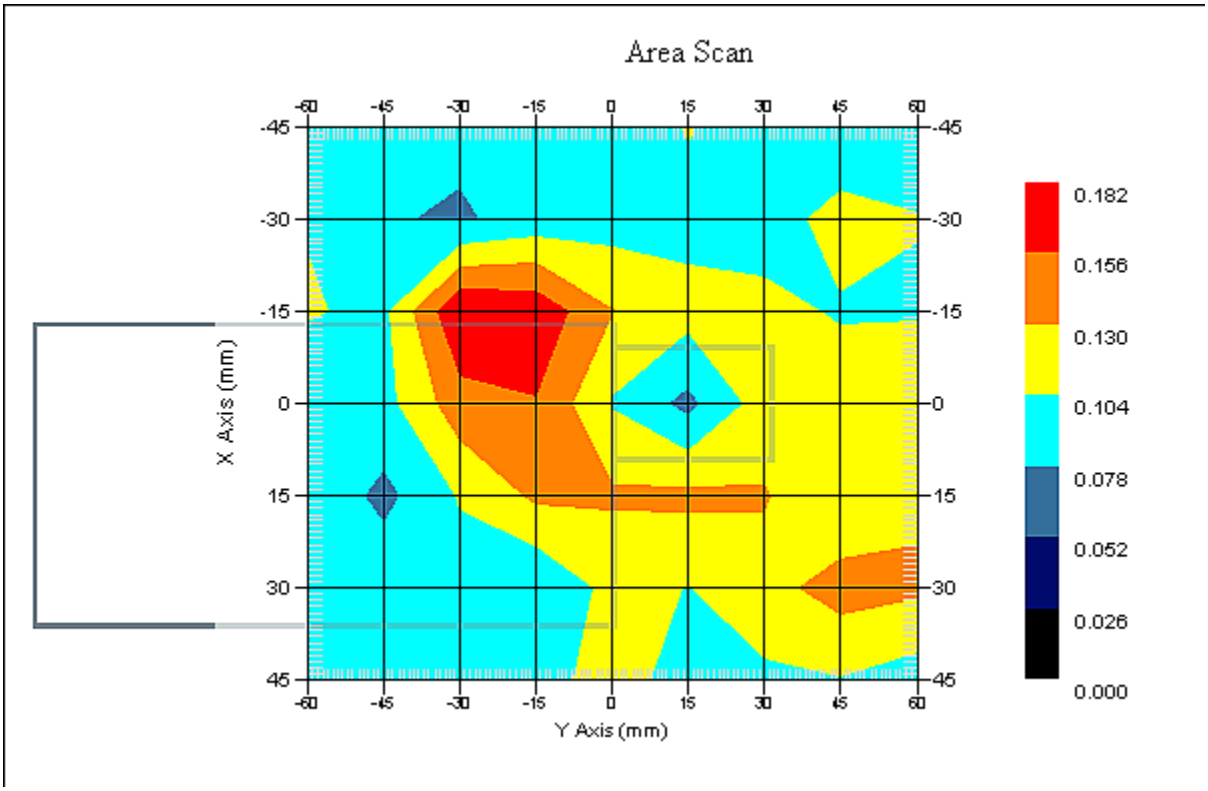
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 2440
Frequency : 2440.00 MHz
Last Calib. Date : 19-Apr-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 51.70 F/m
Sigma : 1.92 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

```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 19-Apr-2013
Set-up Time       : 7:47:36 AM
Area Scan         : 7x9x1 : Measurement x=15mm, y=15mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Front
Separation        : 0 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.123 W/kg
10 gram SAR value   : 0.092 W/kg
Area Scan Peak SAR  : 0.181 W/kg
Zoom Scan Peak SAR  : 0.240 W/kg
```

SAR Test Report

By Operator : Jay
Measurement Date : 19-Apr-2013
Starting Time : 19-Apr-2013 09:27:59 AM
End Time : 19-Apr-2013 09:50:28 AM
Scanning Time : 1349 secs

Product Data
Device Name : Delorme
Serial No. : Eng 1
Mode : Bluetooth
Model : inReach SE
Frequency : 2440.00 MHz
Max. Transmit Pwr : 0.011 W
Drift Time : 0 min(s)
Length : 112 mm
Width : 60 mm
Depth : 30 mm
Antenna Type : Internal
Orientation : Back
Power Drift-Start : 0.075 W/kg
Power Drift-Finish: 0.072 W/kg
Power Drift (%) : -4.000

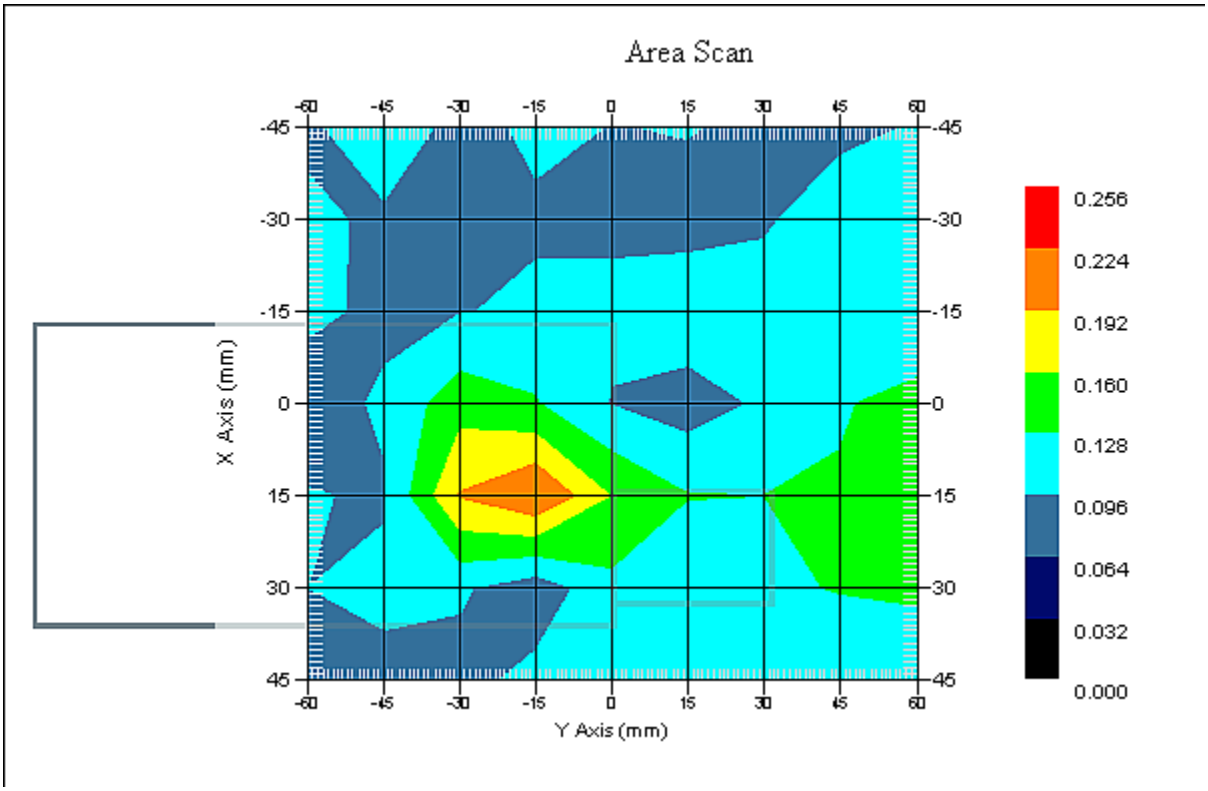
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 2440
Frequency : 2440.00 MHz
Last Calib. Date : 19-Apr-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 51.70 F/m
Sigma : 1.92 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

```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 19-Apr-2013
Set-up Time       : 7:47:36 AM
Area Scan         : 7x9x1 : Measurement x=15mm, y=15mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Back
Separation        : 0 mm
Channel           : Mid
```




```
1 gram SAR value    : 0.103 W/kg
10 gram SAR value   : 0.085 W/kg
Area Scan Peak SAR  : 0.205 W/kg
Zoom Scan Peak SAR  : 0.220 W/kg
```

SAR Test Report

By Operator : Jay
Measurement Date : 19-Apr-2013
Starting Time : 19-Apr-2013 10:19:50 AM
End Time : 19-Apr-2013 10:42:57 AM
Scanning Time : 1387 secs

Product Data
Device Name : Delorme
Serial No. : Eng 1
Mode : Bluetooth
Model : inReach SE
Frequency : 2440.00 MHz
Max. Transmit Pwr : 0.011 W
Drift Time : 0 min(s)
Length : 112 mm
Width : 30 mm
Depth : 60 mm
Antenna Type : Internal
Orientation : Left Side
Power Drift-Start : 0.108 W/kg
Power Drift-Finish: 0.106 W/kg
Power Drift (%) : -2.121

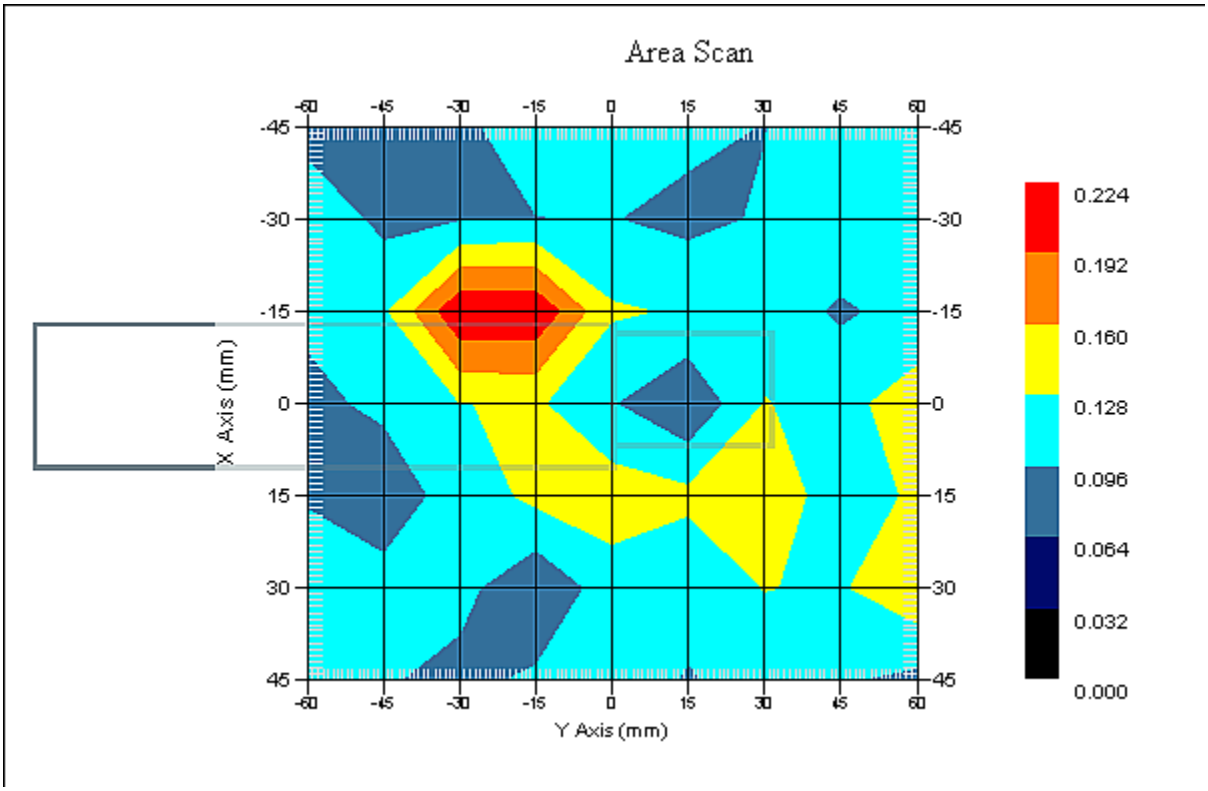
Phantom Data
Name : APREL-Uni
Type : Uni-Phantom
Size (mm) : 280 x 280 x 200
Serial No. : System Default
Location : Center
Description : Uni-Phantom

Tissue Data
Type : BODY
Serial No. : 2440
Frequency : 2440.00 MHz
Last Calib. Date : 19-Apr-2013
Temperature : 20.00 °C
Ambient Temp. : 23.00 °C
Humidity : 45.00 RH%
Epsilon : 51.70 F/m
Sigma : 1.92 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

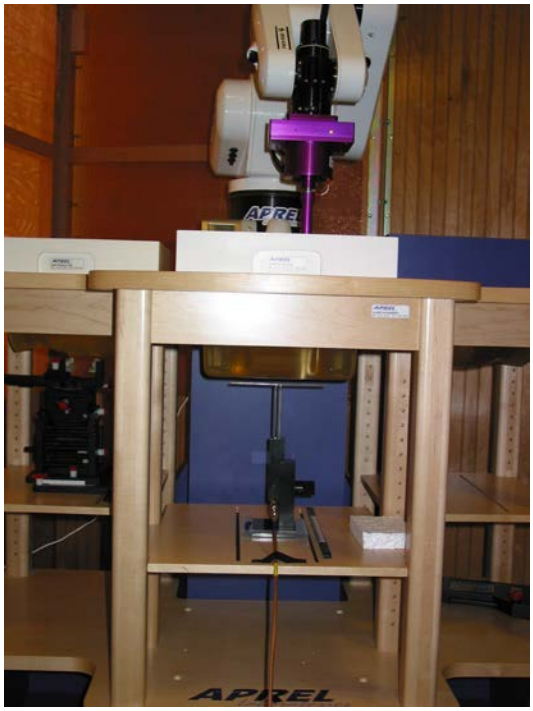
```
Measurement Data
Crest Factor      : 1
Scan Type         : Complete
Tissue Temp.      : 20.00 °C
Ambient Temp.     : 23.00 °C
Set-up Date       : 19-Apr-2013
Set-up Time       : 7:47:36 AM
Area Scan         : 7x9x1 : Measurement x=15mm, y=15mm, z=4mm
Zoom Scan         : 5x5x8 : Measurement x=8mm, y=8mm, z=4mm

Other Data
DUT Position      : Left Side
Separation        : 0 mm
Channel           : Mid
```

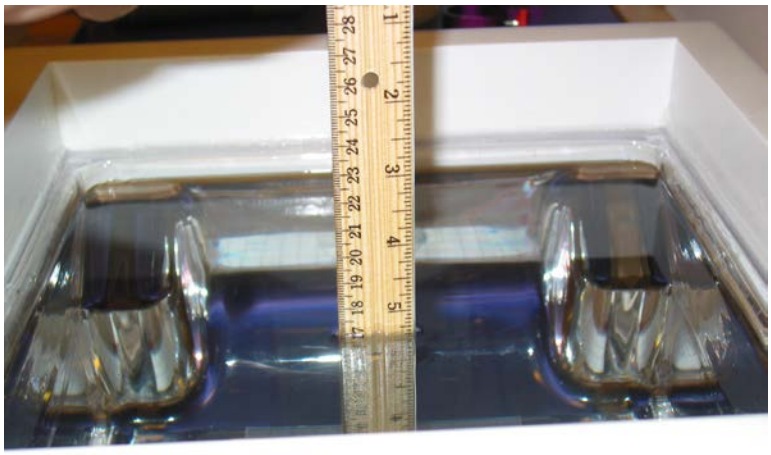



```
1 gram SAR value    : 0.106 W/kg
10 gram SAR value   : 0.080 W/kg
Area Scan Peak SAR  : 0.221 W/kg
Zoom Scan Peak SAR  : 0.250 W/kg
```

Appendix C – SAR Test Setup Photos



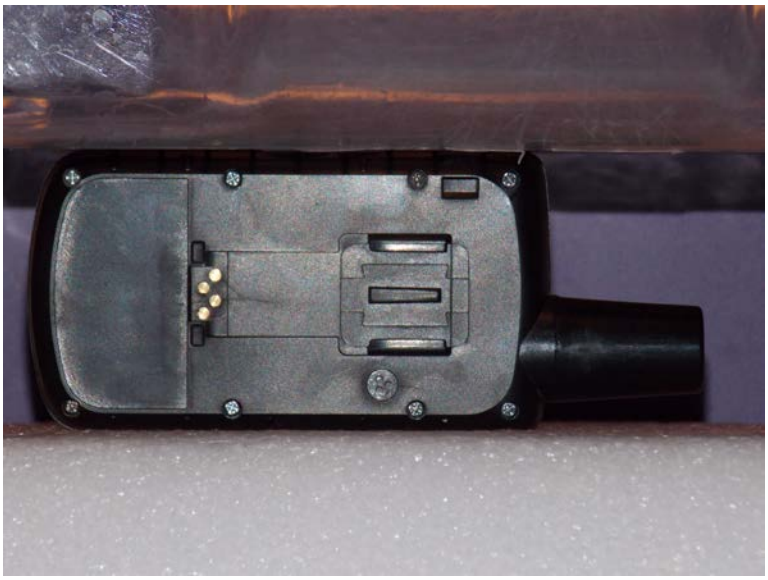
System Body Configuration



Body Tissue Depth

Front Test Position

Back Test Position



Right Test Position

Left Test Position

Front of Device

Back of Device

Appendix D – Probe Calibration Data Sheets

NCL CALIBRATION LABORATORIES

Calibration File No.: PC-1442

Client.: RF Exposure Lab

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

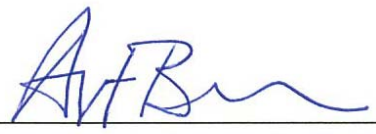
It is certified that the equipment identified below has been calibrated in the **NCL CALIBRATION LABORATORIES** by qualified personnel following recognized procedures and using transfer standards traceable to NRC/NIST.

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 μV/(V/m)^2
Channel Y:	1.2 μV/(V/m)^2
Channel Z:	1.2 μV/(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:

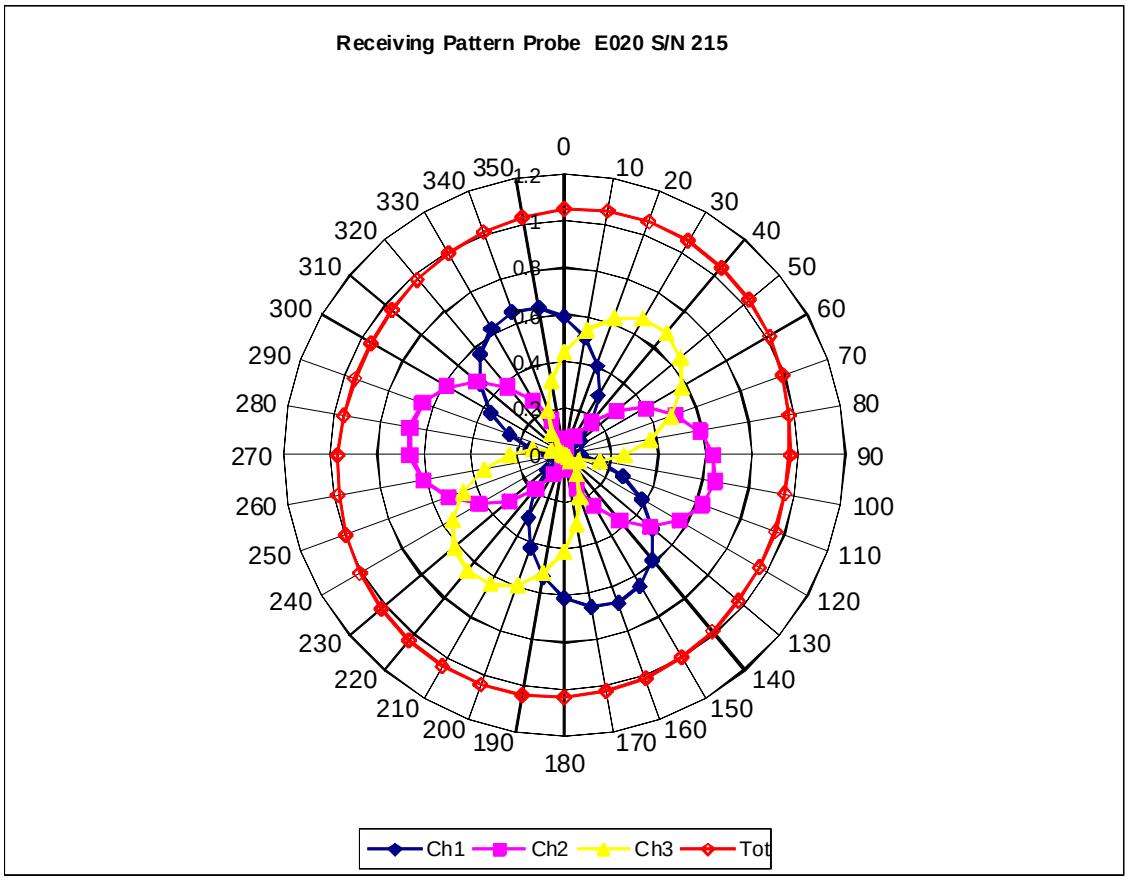
For a distance of 0.58mm the worst case evaluated uncertainty (increase in the probe sensitivity) is less than 2.1%.

NOTES:

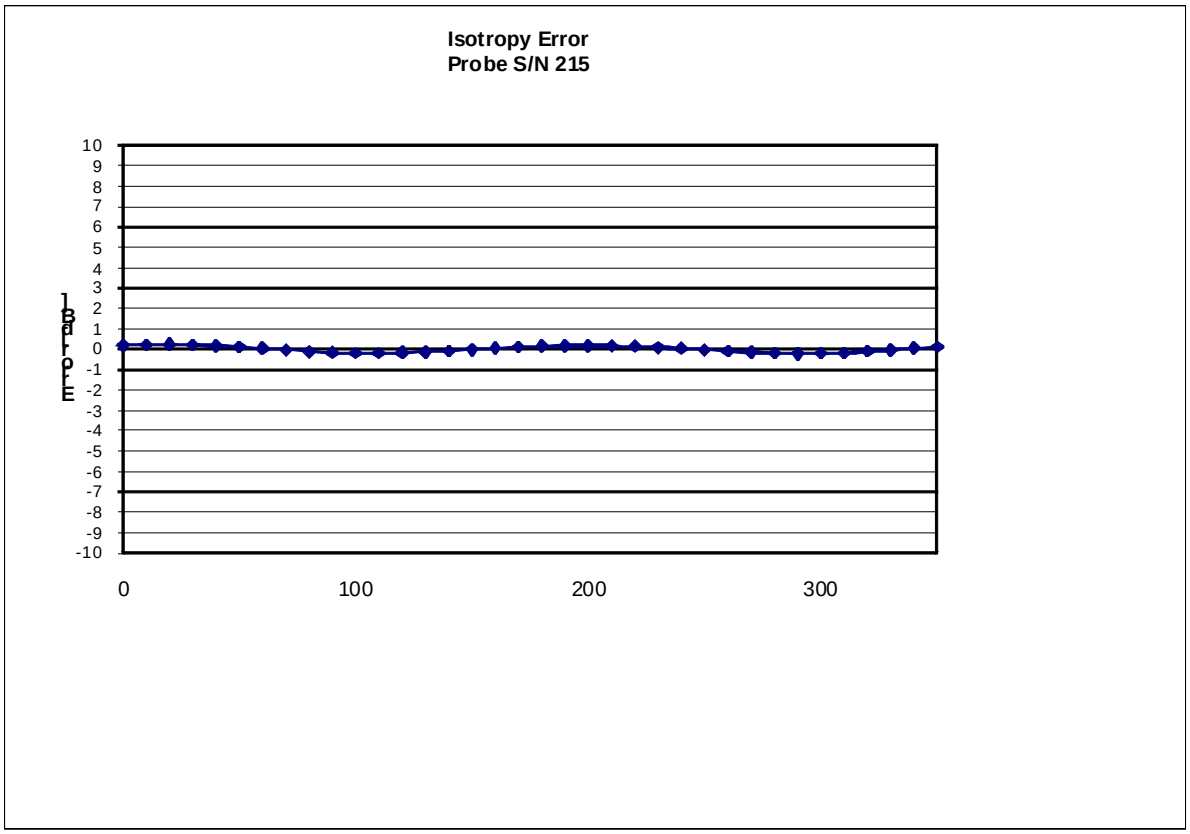
*The maximum deviation from the centre frequency when comparing the lower to upper range is listed.

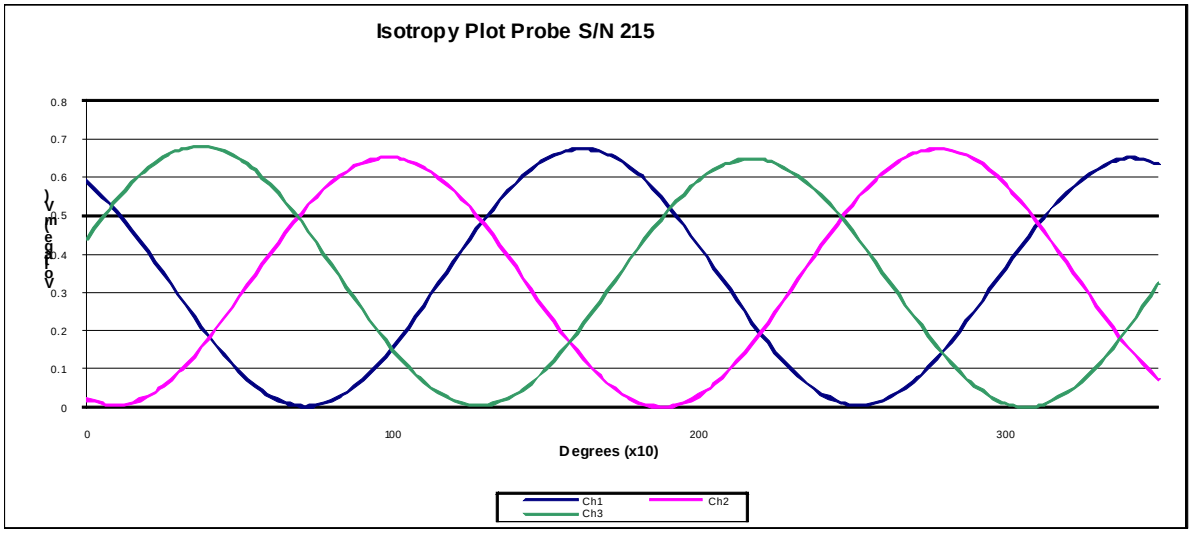
The probe was received in good condition.

Receiving Pattern Air



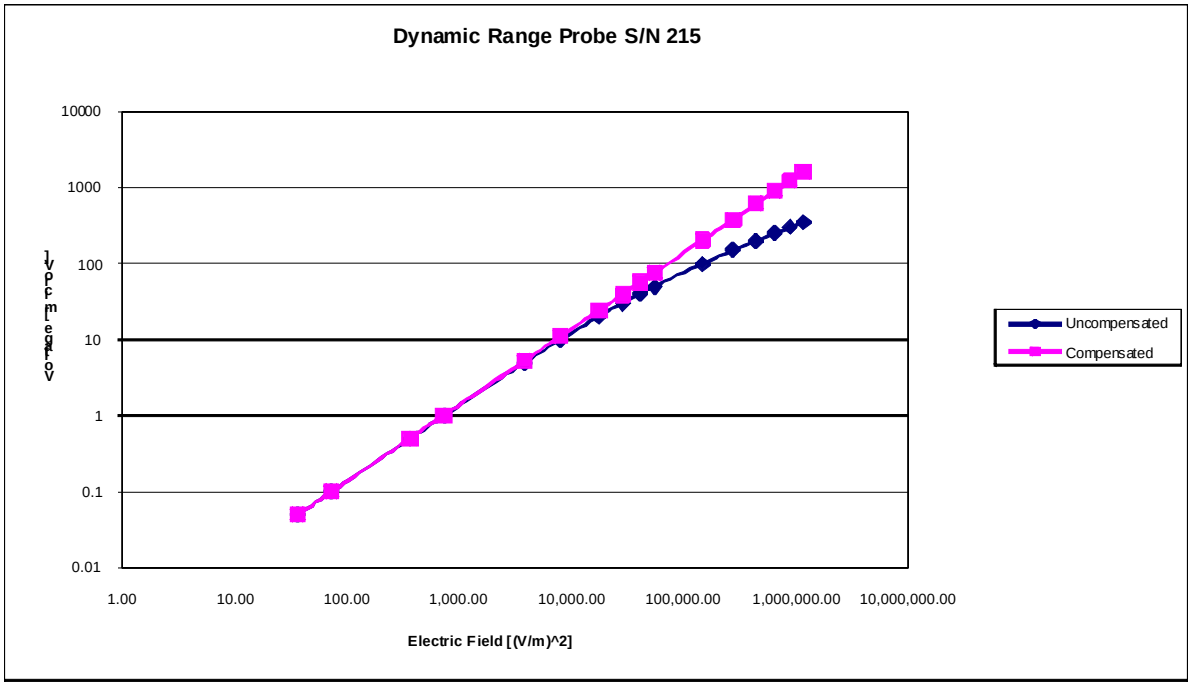
Isotropy Error



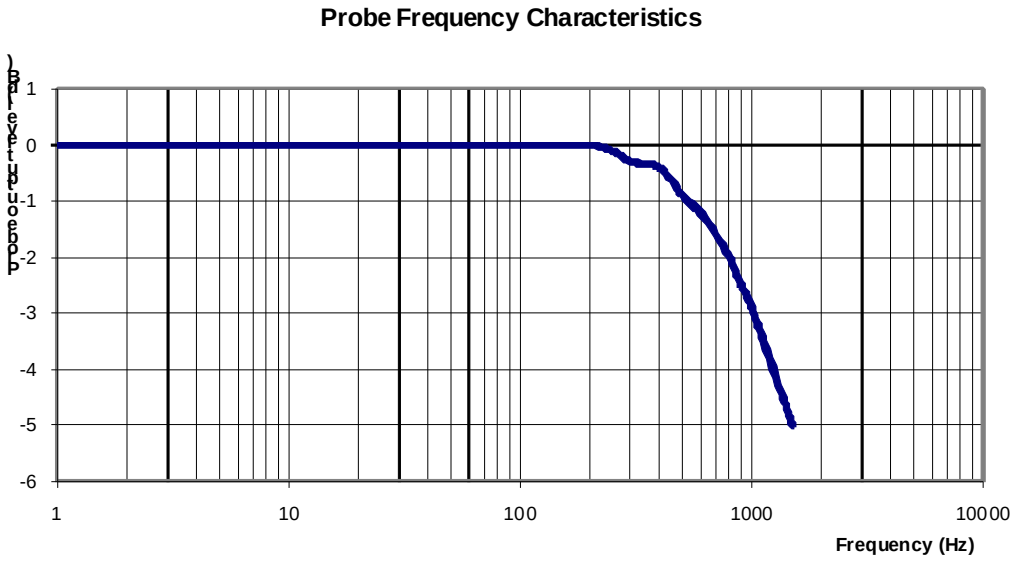


Isotropicity Tissue: 0.12 dB

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.

Appendix E – Dipole Calibration Data Sheets

NCL CALIBRATION LABORATORIES

Calibration File No: DC-1474
Project Number: RFEL-5706

C E R T I F I C A T E OF 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.

Validation Dipole

Manufacturer: APREL Laboratories
Part number: ALS-D-1640-S-2
Frequency: 1640 MHz
Serial No: 207-00101

Customer: RFEL
Head and Body Calibration

Calibrated: 16th January 2013
Released on: 17th January 2013

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

Conditions

Dipole **207-00101** was a re-calibration..

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 21 °C +/- 0.5°C

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

Calibration Results Summary

The following results relate the Calibrated Dipole and should be used as a quick reference for the user.

Mechanical Dimensions

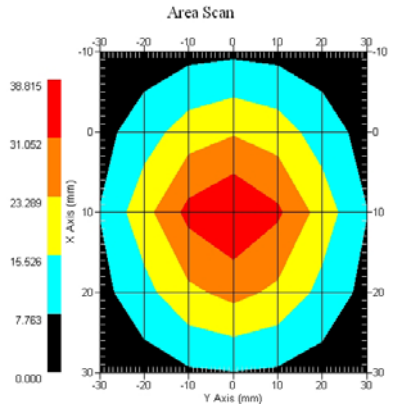
Length: 80.4 mm
Height: 45.7 mm

Electrical Calibration

Test	Result Head	Result Body
S11 R/L	-27.230 dB	-21.566 dB
SWR	1.092 U	1.182 U
Impedance	50.157 Ω	46.306 Ω

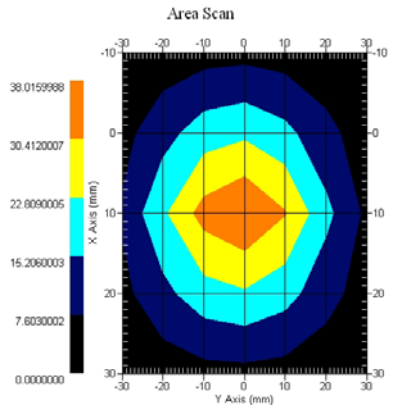
System Validation Results Head

Frequency	1 Gram	10 Gram	Peak
1640 MHz	34.244	18.425	38.8



System Validation Results Body

Frequency	1 Gram	10 Gram	Peak
1640 MHz	32.82	17.78	38.02



This page has been reviewed for content and attested to by signature within this document.

Introduction

This Calibration Report has been produced in line with the SSI Dipole Calibration Procedure SSI-TP-018-ALSAS. The results contained within this report are for Validation Dipole 207-00101. The calibration routine consisted of a three-step process. Step 1 was a mechanical verification of the dipole to ensure that it meets the mechanical specifications. Step 2 was an Electrical Calibration for the Validation Dipole, where the SWR, Impedance, and the Return loss were assessed. Step 3 involved a System Validation using the ALSAS-10U, along with APREL E-020 130 MHz to 26 GHz E-Field Probe Serial Number 212.

References

SSI-TP-018-ALSAS Dipole Calibration Procedure
SSI-TP-016 Tissue Calibration Procedure
IEEE 1528 “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques”

Conditions

Ambient Temperature of the Laboratory: 22 °C +/- 0.5°C
Temperature of the Tissue: 20 °C +/- 0.5°C

Dipole Calibration Results

Mechanical Verification

APREL Length	APREL Height	Measured Length	Measured Height
80.4 mm	45.7 mm	80.4 mm	45.6 mm

Tissue Validation

Tissue 450MHz	Measured Head	Measured Body
Dielectric constant, ε_r	38.5	52.03
Conductivity, σ [S/m]	1.25	1.39

Dipole Calibration uncertainty

The calibration uncertainty for the dipole is made up of various parameters presented below.

Mechanical	1%
Positioning Error	1.22%
Electrical	1.7%
Tissue	2.2%
Dipole Validation	2.2%
TOTAL	**8.32% (16.64% K=2)**

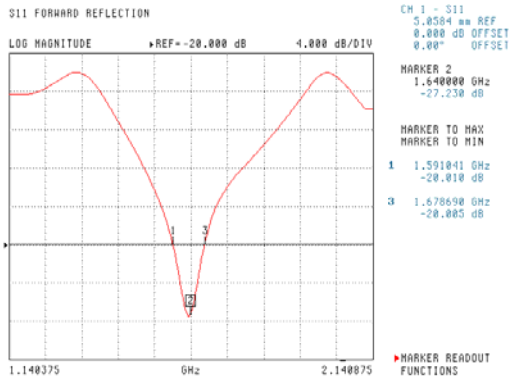
Electrical Calibration

Test	Result Head	Result Body
S11 R/L	-27.230 dB	-21.566 dB
SWR	1.092 U	1.182 U
Impedance	50.157 Ω	46.306 Ω

The Following Graphs are the results as displayed on the Vector Network Analyzer.

S11 Parameter Return Loss

HEAD



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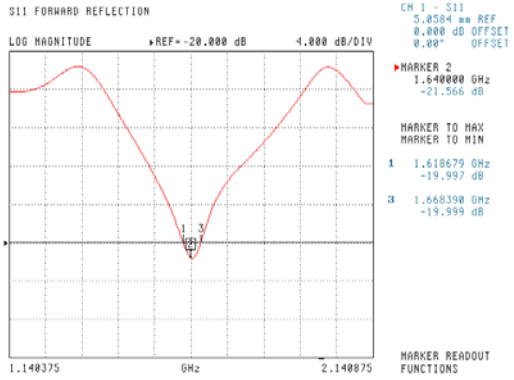
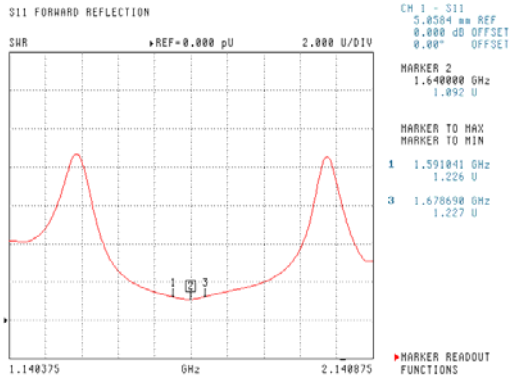


SWR

HEAD



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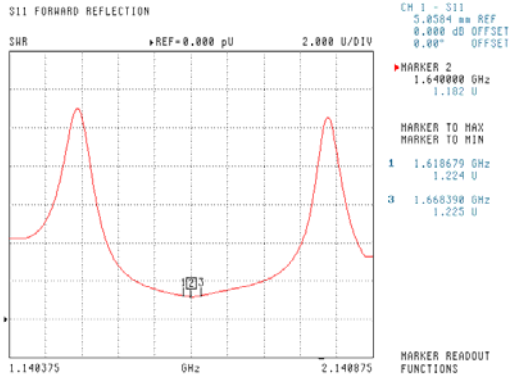
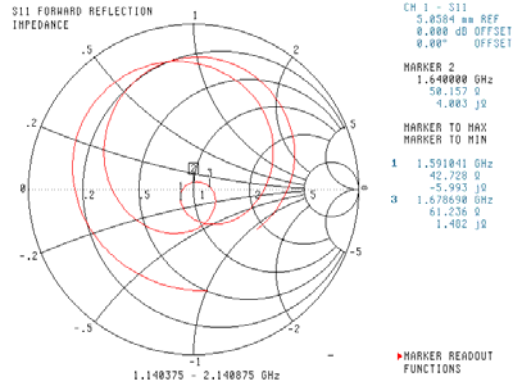


Smith Chart Dipole Impedance

HEAD



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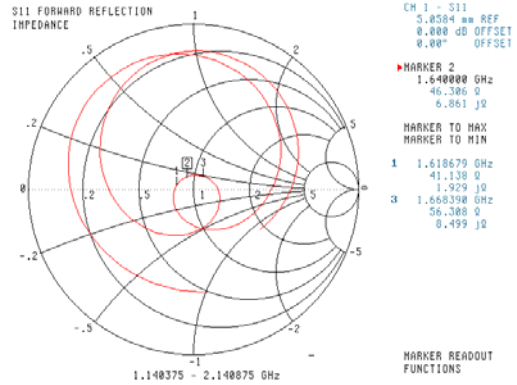


Test Equipment

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.

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

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

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

Accreditation No.: SCS 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

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

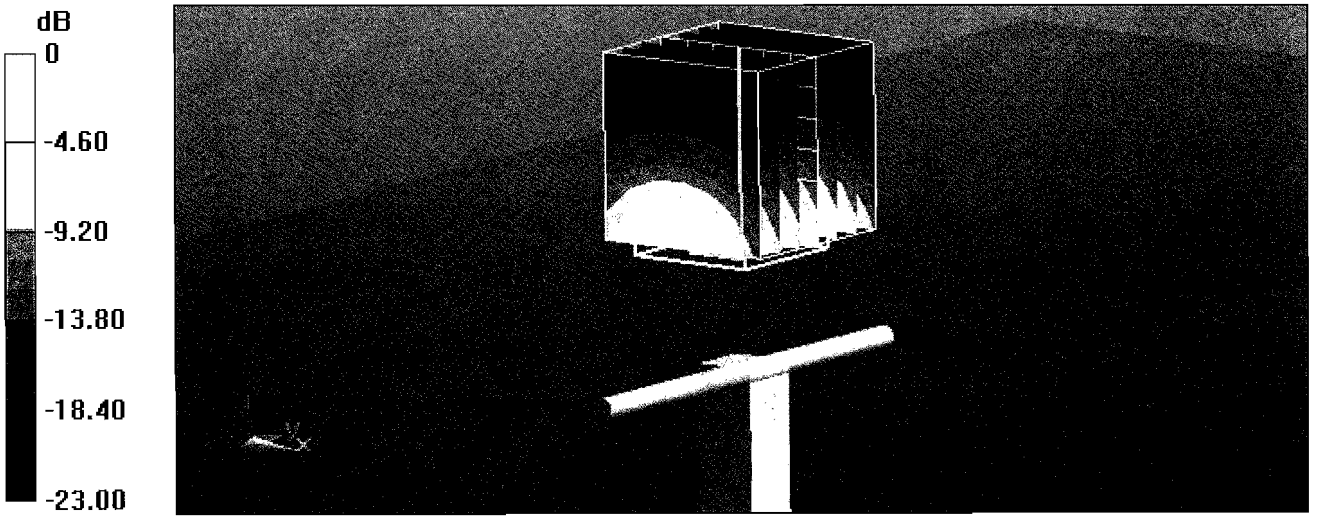
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.84 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

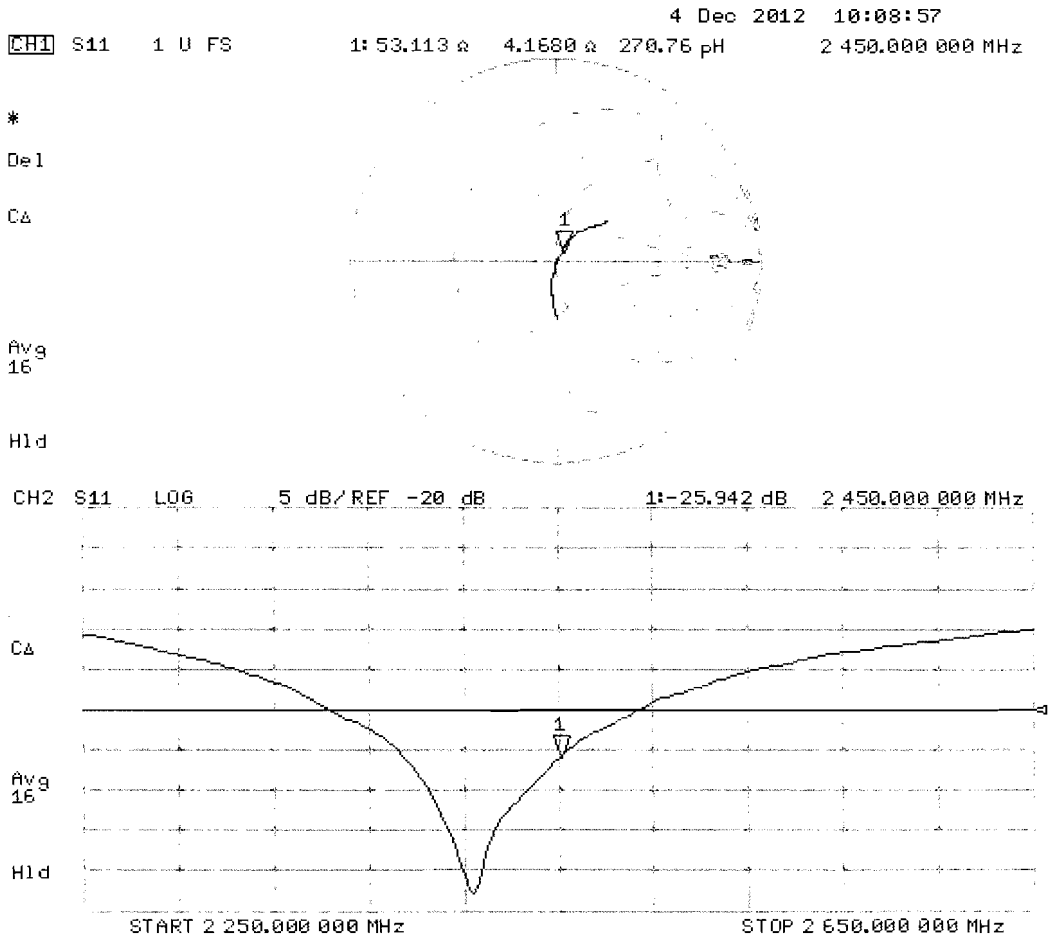
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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

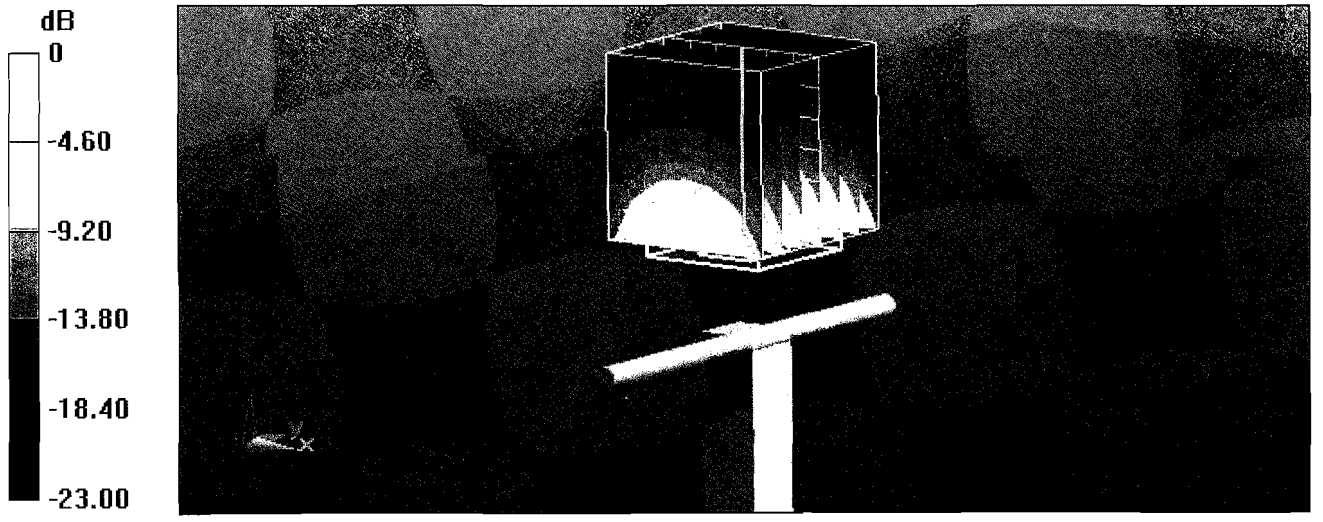
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 mho/m; ε_r = 50.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

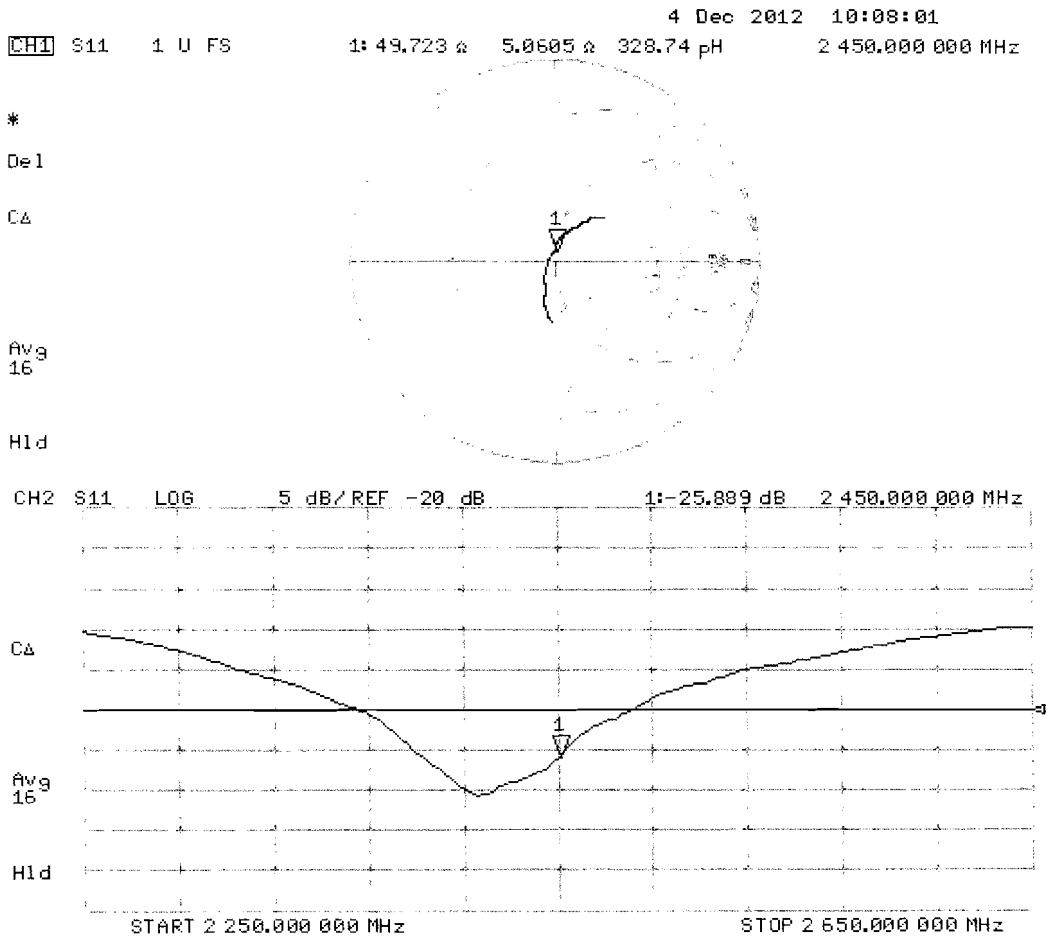
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



Appendix F – Phantom Calibration Data Sheets

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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