APREL Laboratories

Certification Report on

Specific Absorption Rate (SAR) Experimental Analysis for the Bystander

Lipman USA Inc.

Nurit 3010 DataTAC/Ardis Point of Sale Device

Test Date: 8 Aug 2000

LPMB-NURIT 3010 DataTAC-3516B

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CERTIFICATION REPORT

Subject:	**Specific Absorption Rate (SAR) Experimental Analysis for the Bystander**
Product:	Point of Sale Device with a Research in Motion R802D-2-O Radio Modem (DataTAC / Ardis network)
Model:	Nurit 3010, Data TAC / Ardis
Client:	Lipman USA Inc.
Address:	50 Gordon Dr. Syosset, NY 11791 USA
Project #:	LPMB-Nurit 3010 DataTAC-3516B

SAR Certified APREL Laboratories A082 - Nurit 3010D — Telecommunications Approval Board - Spectrum Sciences Institute

Prepared by APREL Laboratories
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Tested by ____________ Date: 18 Aug 2000
Ken O'Donnell
Engineering Technical Staff

Submitted by ____________ Date: 21 Aug 2000
Dr. Paul G. Cardinal
Director, Laboratories

Approved by ____________ Date: Aug 21/2000
Dr. Jacek J. Wojcik, P. Eng.

REGISTERED PROFESSIONAL ENGINEER — J. J. Wojcik — PROVINCE OF ONTARIO

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FCC ID: O2SNURIT3010A
Applicant: Lipman USA Inc.
Equipment: Wireless Point of Sale Terminal with a Research in Motion R802D-2-O Radio Modem (DataTAC / Ardis network)
Model: Nurit 3010, Data TAC / Ardis
Standard: FCC 96 –326, Guidelines for Evaluating the Environmental Effects of Radio-Frequency Radiation

ENGINEERING SUMMARY

This report contains the results of the engineering evaluation performed on a Lipman Nurit 3010 wireless point of sale terminal (POS) operating with a built-in Research in Motion R802-2-D DataTAC/Ardis radio modem. This report is supplementary to the engineering evaluation for user's hand exposure, report LPMB-Nurit 3010 DataTAC-3516U. The measurements were carried out in accordance with FCC 96-326. The POS was evaluated at its nominal maximum power level (2W / 33dBm).). The duty factor of the production R802D-2-O modems will be controlled to be intrinsically restricted to 25% (see Appendix F).

For the SAR Analysis for the Bystander, the Lipman Nurit 3010 wireless point of sale terminal (POS) was tested at low, middle and high channels with the antenna oriented in two positions (at the antenna side of the terminal, 0^o, and pointing straight out, 180^o) as well as the keyboard, battery, antenna, right and top sides. The maximum SAR (8.59 W/kg) was found to coincide with the peak performance RF output power of channel 2000 (low, 806 MHz), with the antenna side of the DUI facing up against the bottom of the phantom and the antenna pointing straight out. Test data and graphs are presented in this report.

Based on the test results and on how the device will be used, with the duty factor of the POS intrinsically limited to less than 3% (see Appendix G), it is certified that the product meets the requirements as set forth in the above specifications, for an uncontrolled RF partial body exposure environment.

(The results presented in this report relate only to the sample tested.)

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1. INTRODUCTION

Tests were conducted to determine the Specific Absorption Rate (SAR) of a sample of a Lipman Nurit 3010 wireless point of sale terminal (POS), which incorporates a Research in Motion R802D-2-O DataTAC/Ardis radio modem. These tests were conducted at APREL Laboratories' facility located at 51 Spectrum Way, Nepean, Ontario, Canada. A view of the SAR measurement setup can be seen in Appendix A Figure 1. This report describes the results obtained.

2. APPLICABLE DOCUMENTS

The following documents are applicable to the work performed:

1) FCC 96-326, Guidelines for Evaluating the Environmental Effects of Radio-Frequency Radiation

2) ANSI/IEEE C95.1-1992, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

3) ANSI/IEEE C95.3-1992, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave.

4) OET Bulletin 65 (Edition 97-01) Supplement C (Edition 97-01), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields".

3. EQUIPMENT UNDER INVESTIGATION

- Lipman Nurit 3010 wireless point of sale terminal (POS), s/n 86U04 5907092, received on 24 July 2000.

The POS will be called DUI (Device Under Investigation) in the following.

The DUI is intended to be used in the hand and may be carried in a case that hooks onto a belt. The antenna is a 5in centre-fed half-wavelengh dipole with a gain of 1 dB.

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A photograph of the DUI can be found in Appendix B. See the manufacturer's submission documentation for drawings and more design details.

4. TEST EQUIPMENT

- APREL Triangular Dosimetric Probe Model E-009, s/n 115, Asset # 301420
- CRS Robotics A255 articulated robot arm, s/n RA2750, Asset # 301335
- CRS Robotics C500 robotic system controller, s/n RC584, Asset # 301334
- APREL F-1, flat manikin, s/n 001
- Tissue Recipe and Calibration Requirements, APREL procedure SSI/DRB-TP-D01-033
- HP 438A power meter, s/n 2502A01684, Asset # 301417
- HP 8482A power sensor, s/n 2652A1512B, Asset # 301418
- Toshiba Laptop computer Satellite ProTM 400S (to setup device via RS232 port)

5. TEST METHODOLOGY

1. The test methodology utilised in the certification of the DUI complies with the requirements of FCC 96-326 and ANSI/IEEE C95.3-1992.
2. The E-field is measured with a small isotropic probe (output voltage proportional to E^2).
3. The probe is moved precisely from one point to the next using the robot (10 mm increments for wide area scanning, 5 mm increments for zoom scanning, and 2.5 mm increments for the final depth profile measurement).
4. The probe travels in the homogeneous liquid simulating human tissue. Appendix D contains information about the recipe and properties of the simulated tissue used for these measurements.
5. The liquid is contained in a manikin simulating a portion of the human body.

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6. The DUI is positioned with the surface under investigation against the phantom.

7. All tests were performed with the highest power available from the sample DUI under transmit conditions.

   More detailed descriptions of the test method is given in Section 6 when appropriate.

6. TEST RESULTS

6.1. TRANSMITTER CHARACTERISTICS

The battery-powered DUI will consume energy from its batteries, which may affect the DUI's transmission characteristics. In order to gage this effect the output of the transmitter is sampled before and after each SAR run. In the case of this DUI, with does not have an externally accessible feedpoint, the radiated power was sampled. A power meter was connected to an antenna adjacent to a fixture to hold the transmitter in a reproducible position. The following table shows the radiated RF power sampled before and after each of the six sets of data used for the worst case SAR in this report.

Table 1. Sampled Radiated RF Power

Scan		Relative Power Reading (dB)	Battery #
Type	Height (mm)		
Area	2.5	-0.30	12
Area	12.5	-0.70	2
Zoom	2.5	-	9
Zoom	7.5	-	9
Zoom	12.5	+0.03	9
Depth	2.5 –22.5	-0.20	11

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6.2. SAR MEASUREMENTS

1) RF exposure is expressed as a Specific Absorption Rate (SAR). SAR is calculated from the E-field, measured in a grid of test points as shown in Appendix A Figure 2. SAR is expressed as RF power per kilogram of mass, averaged in 10 grams of tissue for the extremities and 1 gram of tissue elsewhere.

2) The DUI was put into test mode for the SAR measurements via communications software supplied by the radio manufacturer running on a PC to control the channel and operating power (nominally 2W / 33dBm).

3) Figure 3 in Appendix A shows a contour plot of the SAR measurements for the DUI (channel 2000, low, 806 MHz, antenna side, antenna pointing straight out, 2W / 33dBm). The presented values were taken 2.5mm into the simulated tissue from the flat phantom's solid inner surface. Figures 1 and 2 show the flat phantom used in the measurements. A grid is shown inside the phantom indicating the orientation of the x-y grid used, with the co-ordinates (0,0) on the top left (orange dot). The x-axis is positive towards the bottom and the y-axis is positive towards the right. For this side of the DUI, the bottom was aligned with y = 1, and the antenna, with x = 2.

   A different presentation of the same data is shown in Appendix A Figure 4. This is a surface plot, where the measured SAR values provide the vertical dimension, which is useful as a visualisation aid.

   Similar data was obtained 12.5 mm into the simulated tissue. These measurements are presented as a contour plot in Appendix A Figure 5 and surface plot in Figure 6.

   Figure 10 in Appendix A shows an overlay of the DUI's outlines, superimposed onto the contour plot previously shown as Figure 3.

   Figures 3 through 6 in Appendix A show that there is a dominant peak, in the contour plots, that diminishes in magnitude with depth into the tissue simulation.

4) For the SAR Analysis for the Bystander (Table 2), wide area scans were performed for the low (2000, 806 MHz), middle (20D0, 815 MHz) and high (24B0, 821 MHz) channels. The antenna was also oriented in two positions: stowed (0^o) and pointing straight out (180^o), with the keyboard, battery, antenna, right and top sides of the DUI facing up against the bottom of the phantom. The

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DUI was operating at maximum output power (2W / 33dBm) and 25% duty factor (see Appendix F). The peak single point SAR for the scans were:

Table 2. SAR Measurements for the Bystander

DUI side	Antenna position	Channel			Peak SAR (W/kg)
		L/M/H	#	Freq (MHz)	
keyboard side	extended	low	2000	806	0.72
battery side	extended	low	2000	806	0.57
antenna side	**extended**	**low**	**2000**	**806**	**10.36**
right side	extended	low	2000	806	1.23
antenna side	extended	middle	20D0	815	9.91
antenna side	extended	high	24B0	821	10.30
antenna side	stowed (0^o)	low	2000	806	7.62
antenna side	stowed (0^o)	middle	20D0	815	7.38
antenna side	stowed (0^o)	high	24B0	821	7.40
top side	stowed (0^o)	low	2000	806	0.36
battery side with carrier	stowed (0^o)	low	2000	806	0.11

All subsequent testing for user was performed on channel 2000 (low, 806 MHz), with the antenna pointing straight out (180^o) and the antenna side of the DUI against the phantom.

5) Wide area scans were then performed on channel 2000 (low, 806 MHz) versus separation at 100% duty factor. The peak single point SAR for the scans were:

Table 3. SAR versus DUI Separation

Channel			DUI to phantom's inner surface separation (mm)	Peak SAR (W/kg)
L/M/H	#	Freq (MHz)		
low	2000	806	13	5.56
			23	2.72
			33	1.29

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6) Channel 2000 (low, 806 MHz) was then explored on a refined 5 mm grid in three dimensions. Figures 7, 8 and 9 show the measurements made at 2.5, 7.5 and 12.5 mm, respectively. The SAR value averaged over 1 gram was determined from these measurements by averaging the 27 points (3x3x3) comprising a 1 cm cube. The maximum SAR value measured averaged over 1 gram was determined from these measurements to be 6.33 W/kg.

7) To extrapolate the maximum SAR value averaged over 1 gram to the inner surface of the phantom a series of measurements were made at a few (x,y) co-ordinates within the refined grid as a function of depth, with 2.5 mm spacing. Figure 11 in Appendix A shows the data gathered and the exponential curves fit to them. The average exponential coefficient was determined to be (-0.063 ± 0.006) / mm.

8) The distance from the probe tip to the inner surface of the phantom for the lowest point is 2.5 mm. The distance from the probe tip to the tip of the measuring dipole within the APREL Triangular Dosimetric Probe Model E-009 is 2.3 mm. The total extrapolation distance is 4.8 mm, the sum of these two.

   Applying the exponential coefficient over the 4.8 mm to the maximum SAR value averaged over 1 gram that was determined previously, we **obtain the maximum SAR value at the surface averaged over 1 gram**, 8.59 W/kg.

7. SEPARATION AT 25% DF

The measurements of highest local SAR versus separation of the DUI from the bottom of the phantom (Section 6.2.5) will enable the maximum 1g SAR measured for a separation of 3 mm (previous section) to be interpolated for other separations.

If the data for Figure 11 is fitted to an exponential equation we get:

$$\text{Peak Local SAR} = 11.931\, e^{-0.0658 * (\text{separation})}$$

A similar equation will exist for the maximum 1g SAR versus separation:

$$\text{Maximum 1g SAR} = k\, e^{-0.0658 * (\text{separation})}$$

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Using this equation with the previous section's data:

Maximum 1g SAR at the surface = 8.59W/kg
Tissue to DUI separation = 3 mm,

results in a k = 10.463 W/kg, which corresponds to the maximum 1g SAR when the separation is 0 mm. A conservative maximum 1g SAR of 1.23 W/kg (1.6 W/kg reduced by our measurement uncertainty) would occur for a separation of 32.6 mm.

At a standard separation distance of 4 cm the maximum 1g SAR would be 0.75 W/kg.

8. DUTY FACTORS

The firmware of the production Research in Motion OEM R802D-2-O radio modem that is built into the wireless point of sale device (POS) limits its duty factor to 25% (see Appendix F). In addition, the manufacturer's software limits the operation further to 2.1% (see Appendix G).

The test software supplied by Research in Motion permitted the SAR testing to also be performed with a duty factor of 25%. However, testing with a duty factor of 2.1% was impractical as the period for one cycle would be 4.8 seconds with the current test software (minimum transmit on time of 100ms).

Consequently, the maximum 1g SAR for the end product, with a maximum 2.1% duty factor, has to be estimated using proportional scaling with respect to the duty factor. The **maximum 1g SAR value at the surface averaged over 1 gram is** 0.72 W/kg.

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9. CONCLUSIONS

The maximum Specific Absorption Rate (SAR) averaged over 1 gram, determined at 806 MHz (channel 2000, low, antenna side, antenna pointing straight out, 2W / 33dBm) of the Lipman Nurit 3010 wireless point of sale terminal (POS), which incorporates a Research in Motion R-802D-2-O radio modem (DataTAC / Ardis network) operating with a 25% duty factor, is 8.59 W/kg. The overall margin of uncertainty for this measurement is ±23.2 % (Appendix C). The SAR limit given in the FCC 96-326 safety guideline for uncontrolled RF partial body exposure (1.6 W/kg reduced by the measurement uncertainty) is 1.23 W/kg.

Since the POS duty factor is limited to 2.1% by the manufacture's (Lipman, see Appendix G) software, the maximum SAR averaged over 1 gram at this duty factor would be 0.72 W/kg.

Considering the above, this unit as tested, and as it will be marketed, with a duty factor of less than 3%, is found to be compliant with this requirement.

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APPENDIX A. Measurement Setup and SAR Graphs

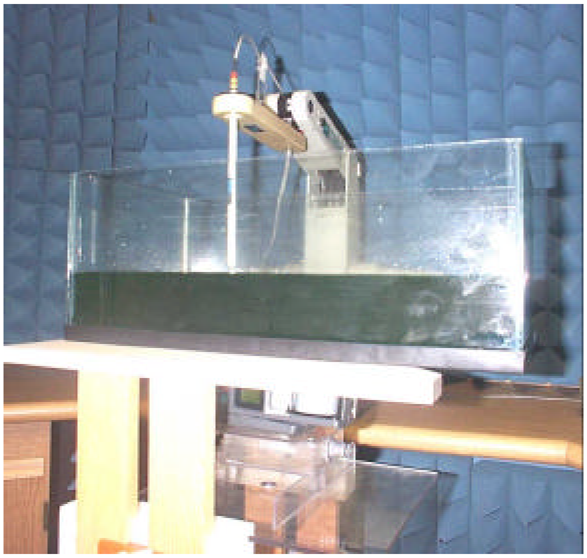


Figure 1. Setup and Close up of the Setup

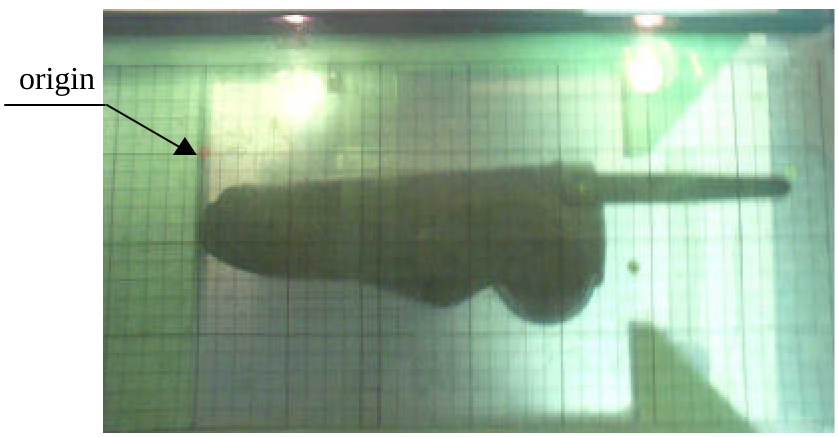

Figure 2. Grid inside the Phantom

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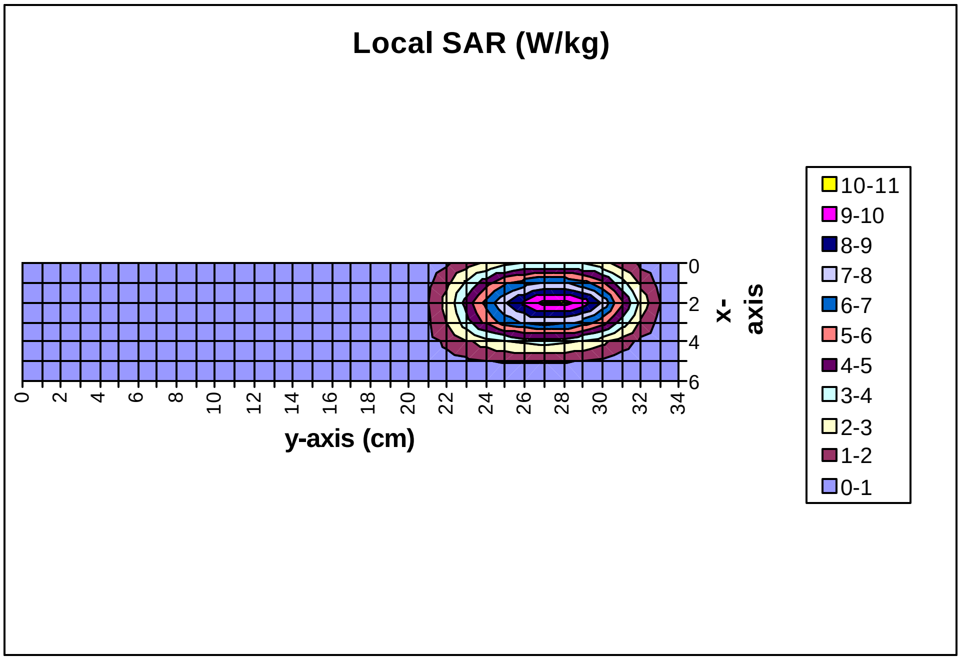

Figure 3. Contour Plot of the Area Scan 2.5mm Above Phantom Surface

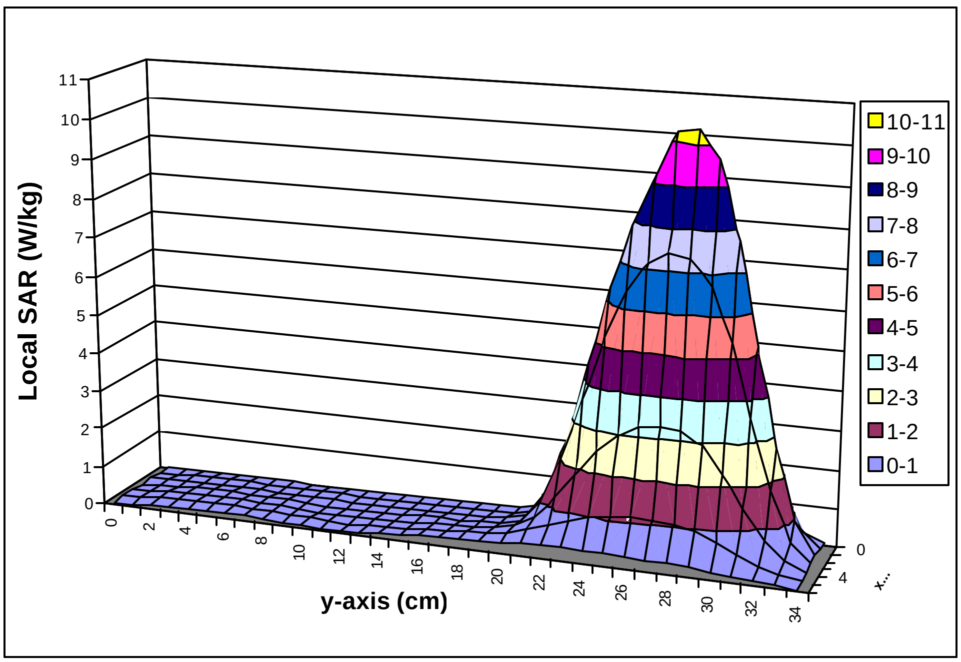

Figure 4. Surface Plot of the Area Scan 2.5mm Above Phantom Surface

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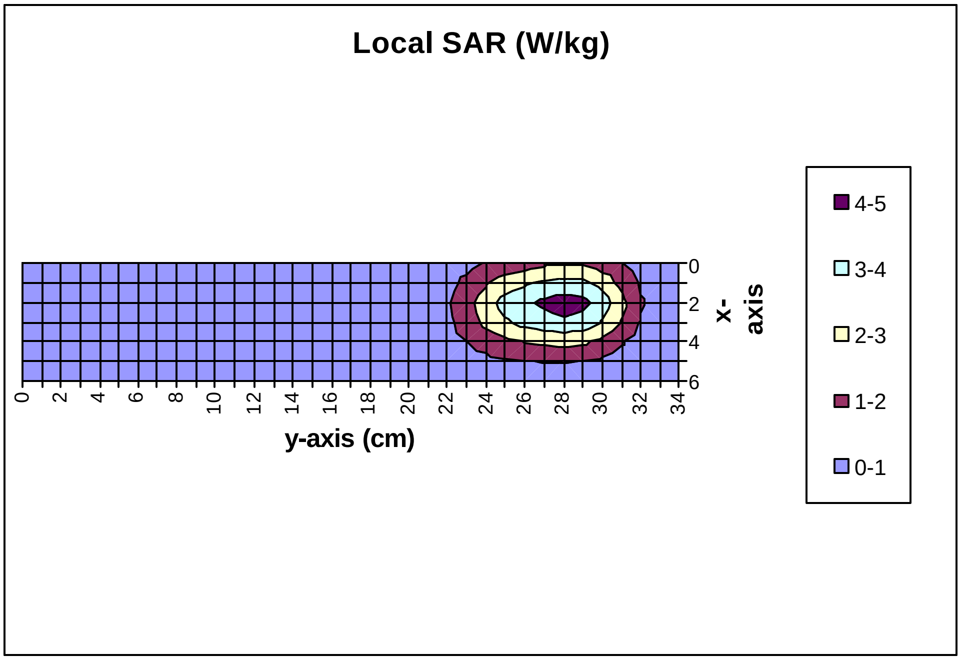

Figure 5. Contour Plot of the Area Scan 12.5mm Above Phantom Surface

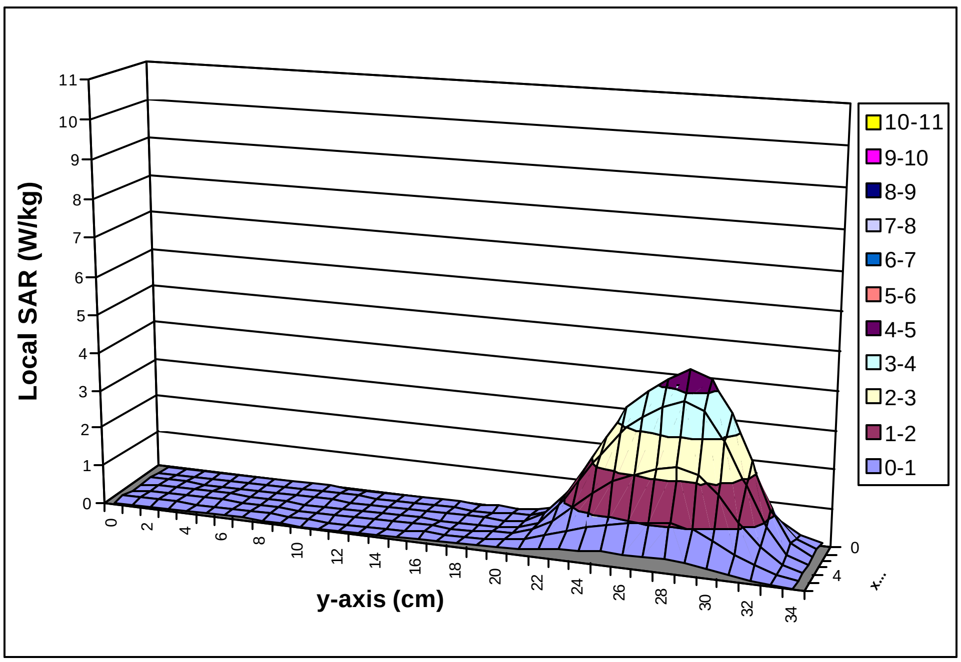

Figure 6. Surface Plot of the Area Scan 12.5mm Above Phantom Surface

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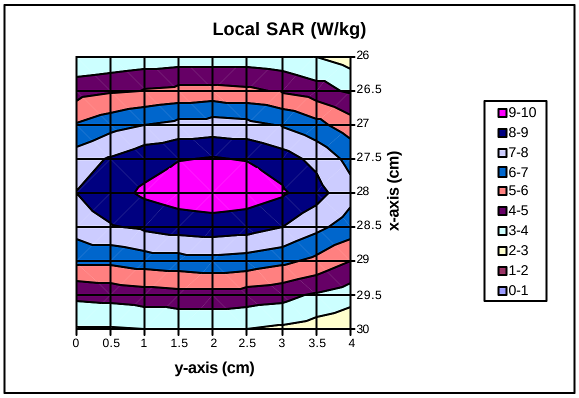

Figure 7. Zoom Scan 2.5mm Above Phantom Surface

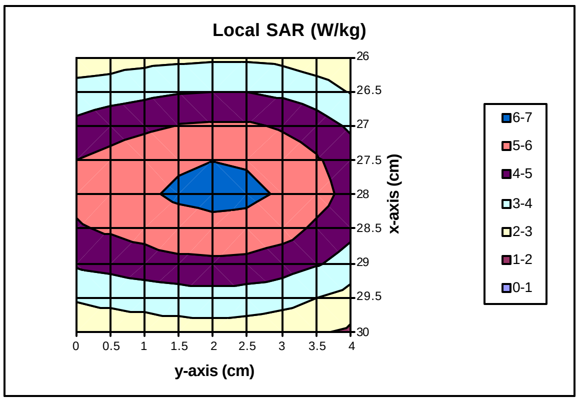

Figure 8. Zoom Scan 7.5mm Above Phantom Surface

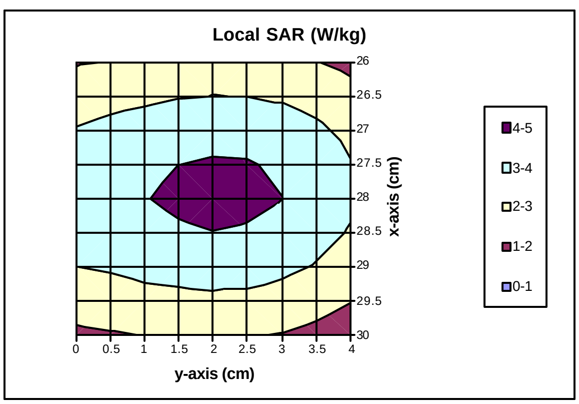

Figure 9. Zoom Scan 12.5mm Above Phantom Surface

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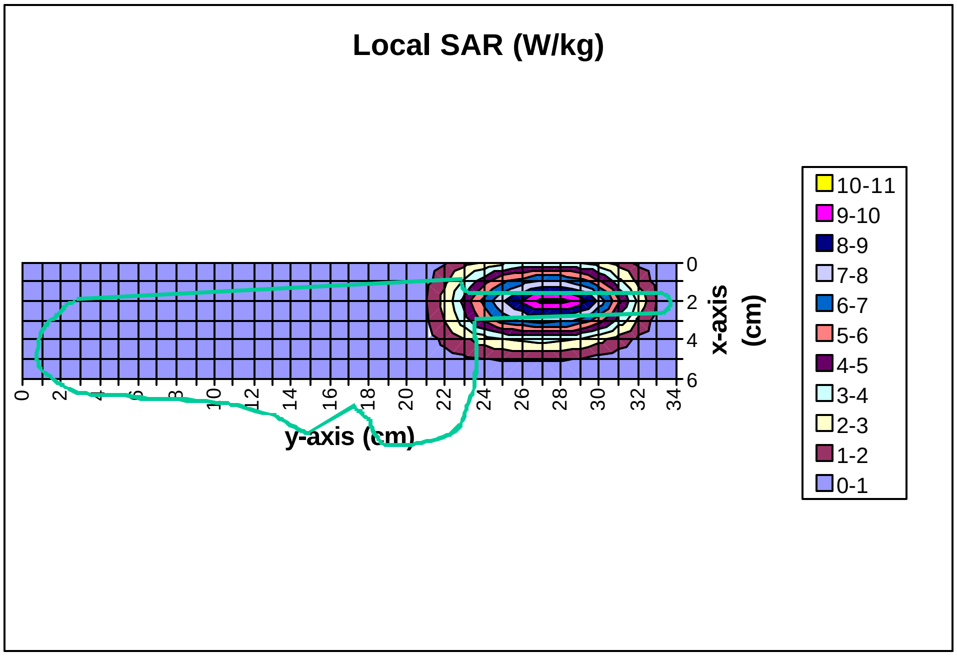

Figure 10. Overlay of the DUI's Outlines Superimposed onto the Area Scan

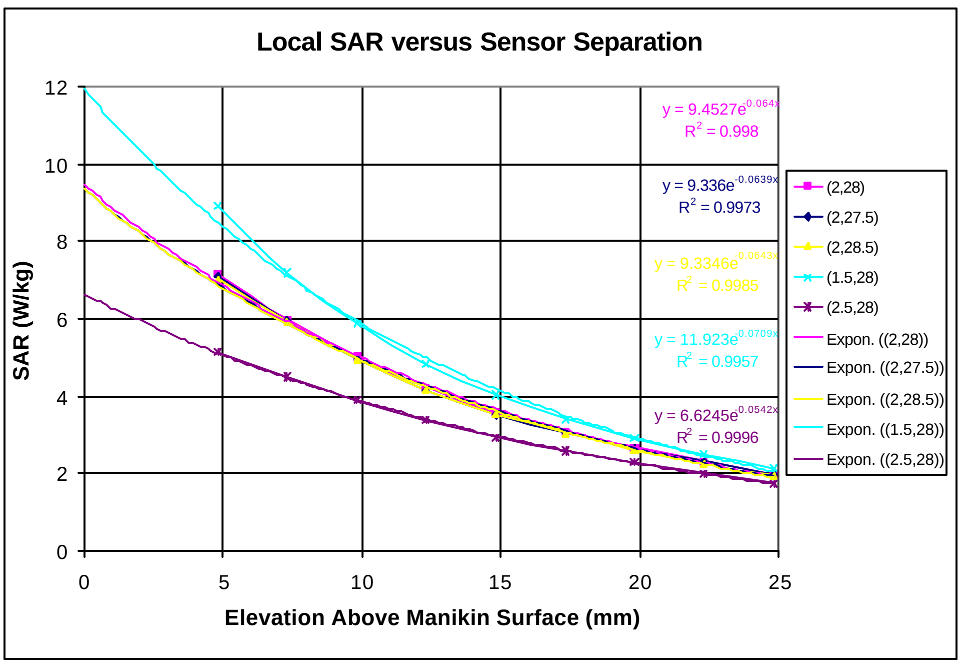

Figure 11. Local SAR versus Sensor Separation

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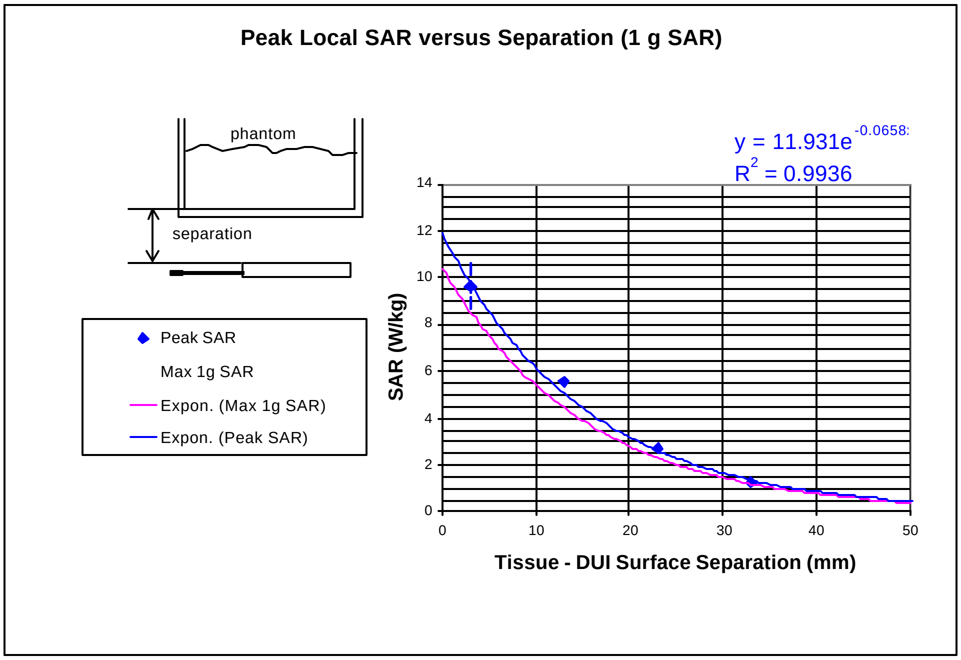

Figure 12. Peak Local SAR versus Separation (1g SAR)

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APPENDIX B. Manufacturer's Specifications

Antenna stowed (0^o position)

Antenna extended (180^o position)

The antenna is a 5in centre-fed half-wavelengh dipole with a gain of 1 dB

(See manufacturer's submission documentation for drawings and more design details)

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APPENDIX C. Uncertainty Budget

Uncertainties Contributing to the Overall Uncertainty

Type of Uncertainty	Specific to	Uncertainty	
Power variation due to battery condition	DUI	8.4%	
Extrapolation due to curve fit of SAR vs depth	DUI & setup	18.8%	
Extrapolation due to depth measurement	setup	3.1%	
Conductivity	setup	6.0%	
Density	setup	2.6%	
Tissue enhancement factor	setup	7.0%	
Voltage measurement	setup	1.1%	
Probe sensitivity factor	setup	3.5%	
		23.2%	**RSS**

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APPENDIX D. Simulated Muscle Tissue Material and Calibration Technique

The mixture used was based on that presented SSI/DRB-TP-D01-033, "Tissue Recipe and Calibration Requirements".

De-ionised water	52.8%
Sugar	45.3%
Salt	1.5%
HEC	0.3 %
Bactericide	0.1 %

Mass density, ρ 1.30 g/ml
(The density used to determine SAR from the measurements was the recommended 1040 kg/m^3 found in Appendix C of Supplement C to OET Bulletin 65, Edition 97-01).

Dielectric parameters of the simulated tissue material were determined using a Hewlett Packard 8510 Network Analyser, a Hewlett Packard 809B Slotted Line Carriage, and an APREL SLP-001 Slotted Line Probe.

The dielectric properties at 815 MHz are:

	APREL	OET 65 Supplement	Δ (%) (OET)
Dielectric constant, ε_r	58.8	56.17	4.6%
Conductivity, σ [S/m]	1.08	0.94	14.8%
Tissue Conversion Factor, γ	5.9	-	-

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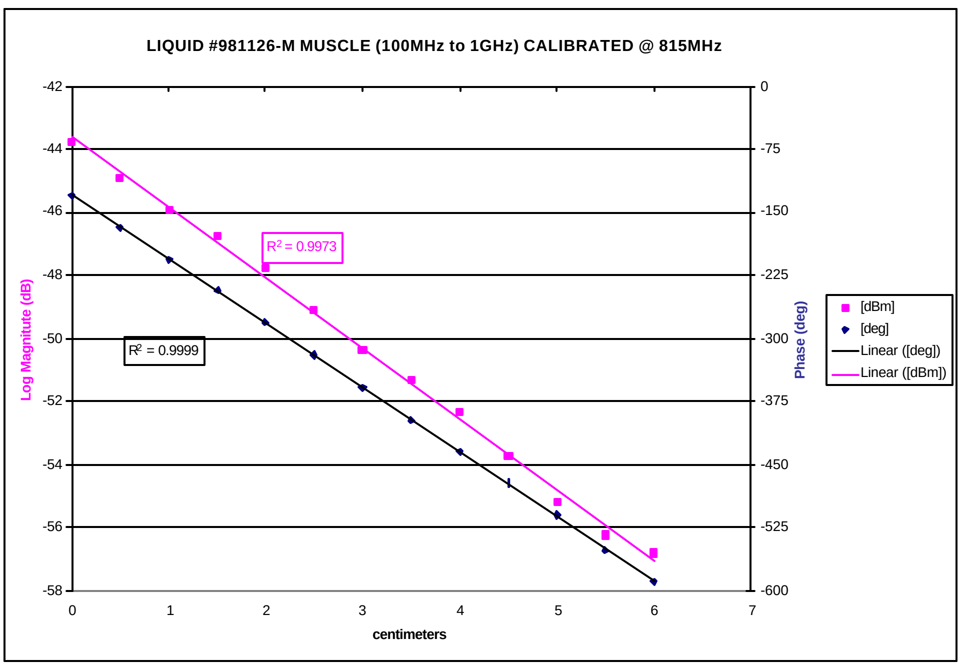
SIMULATION FLUID #	981126-M
CALIBRATION DATE	1-Aug-00
CALIBRATED BY	Ken O'Donnell
Frequency Range	100MHz-1GHz
Frequency Calibrated	815 MHz
Tissue Type	Muscle

Position	Amplitude	Phase	
[cm]	[dBm]	[deg]	[deg]
0	-43.750	-129.300	-129.3
0.5	-44.890	-167.050	-167.05
1	-45.920	154.260	-205.74
1.5	-46.730	116.900	-243.1
2	-47.730	79.090	-280.91
2.5	-49.110	39.910	-320.09
3	-50.360	1.440	-358.56
3.5	-51.320	-37.050	-397.05
4	-52.320	-73.480	-433.48
4.5	-53.730	-111.560	-471.56
5	-55.190	-149.230	-509.23
5.5	-56.220	167.960	-552.04
6	-56.800	130.740	-589.26

ΔdB_1	-6.61	Δdeg_1	-229.26
ΔdB_2	-6.43	Δdeg_2	-230
ΔdB_3	-6.4	Δdeg_3	-227.74
ΔdB_4	-7	Δdeg_4	-228.46
ΔdB_5	-7.46	Δdeg_5	-228.32
ΔdB_6	-7.11	Δdeg_6	-231.95
ΔdB_7	-6.44	Δdeg_7	-230.7
ΔdB_{AVG} [dB]	-6.78	Δdeg_{AVG} [deg]	-229.49
dB_{AVG} (α_{AVG}) [dB/cm]	-2.26	deg_{AVG} (β_{AVG}) [deg/cm]	-76.49666667
(α_{AVG}) [NP/cm]	-0.260137292	(β_{AVG}) [rad/cm]	-1.3351187

f [Hz]	8.15E+08
μ [H/cm]	1.25664E-08
ε_o [F/cm]	8.854E-14

ε_r	**58.8**
$\sigma_{effective}$	**1.08**



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SAR Certified APREL

815 MHz Data (Heike & Tony) MUSCLE with E115

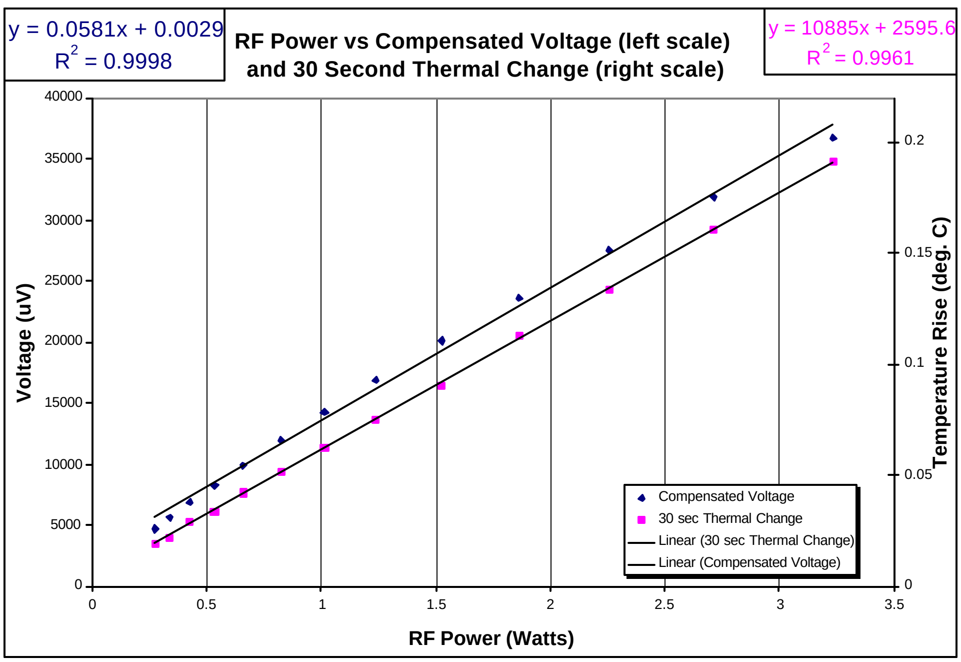
						delta T	Sum		Thermal
RF Power			Ch0	Ch1	Ch2	(30 sec)	Vi/Ei		SAR
W	dBm	R&S	uV	uV	uV	deg. C			W/kg
0.277332	24.43	-21.68	1416	2637	7959	0.019	4686		1.78
0.343558	25.36	-20.75	1611	3174	9668	0.022	5638		2.02
0.427563	26.31	-19.8	1953	3857	11768	0.029	6858		2.67
0.534564	27.28	-18.83	2295	4687	14111	0.034	8228		3.10
0.660693	28.2	-17.91	2734	5615	16943	0.042	9866		3.86
0.827942	29.18	-16.93	3271	6836	20508	0.051	11942		4.75
1.013911	30.06	-16.05	3906	8203	24316	0.062	14207		5.73
1.241652	30.94	-15.17	4687	9863	28760	0.075	16891		6.94
1.527566	31.84	-14.27	5664	11816	33936	0.09	20050		8.35
1.86638	32.71	-13.4	6738	14111	39648	0.113	23588		10.43
2.259436	33.54	-12.57	7959	16699	45947	0.134	27526		12.39
2.716439	34.34	-11.77	9424	19580	52783	0.16	31881		14.83
3.235937	35.1	-11.01	11035	22803	60303	0.191	36693		17.70

Directional Coupler factor 26.11 dB (Asset 100251 cal file data)
Additional inline attenuation 20 dB

Sensitivity (e) 1.692 1.765 1.694 - Sensor Sensitivity in mV/ (mW/cm^2): 815 MHz cal (HW, 2 Jul 99
η = 1.50 e 2.538 2.648 2.541

Density	1.3	g/cm^3	1300	kg/m^3	- Marcin, summer 97	
Conductivity	10.7	mS/cm	1.07	S/m	- Heike 8-Jul-99	
Heat Capacity (c)	2.775	J/C/g	2775	J/C/kg	- average of Balzano (2.7) and Kuster (2.85) values	
Exposure Time	30	seconds	30	seconds		
Slope of Measure Voltage (m_V)	10885	uV/W	0.011	V/W		
- standard error or m_V	206.5	uV/W	2E-04	V/W		1.9%
Slope of Measure Temp Change (m_T)	0.058	C/W	0.058	C/W		
- standard error or m_T	2E-04	C/W	2E-04	C/W		0.4%

Tissue Conversion Factor (γ) 5.9



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APPENDIX E. Validation Scans on a Flat Phantom

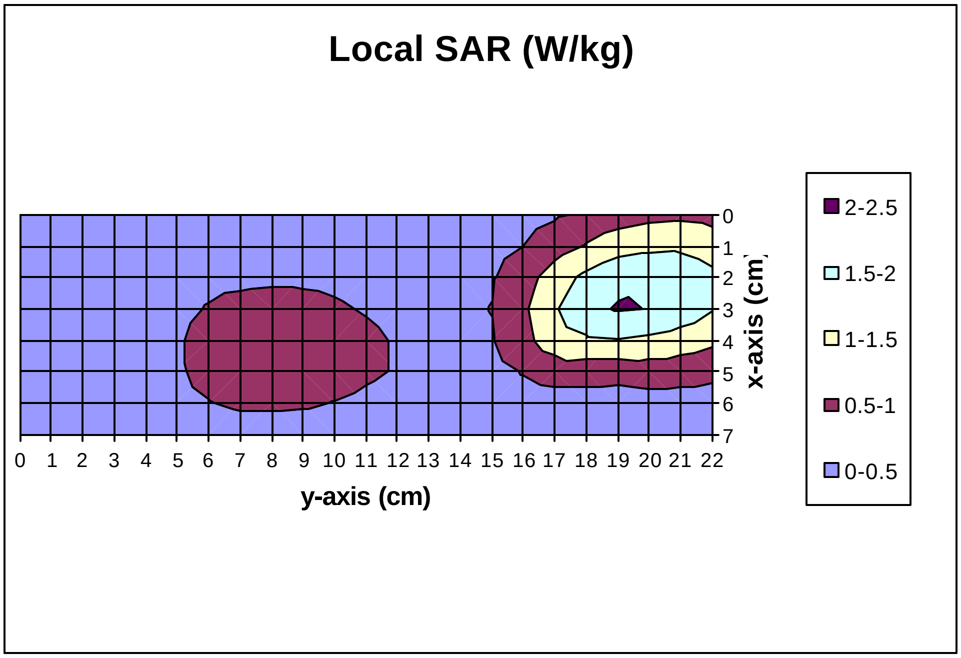

Figure 13. Contour Plot of the Reference Area Scan 2.5mm Above Phantom

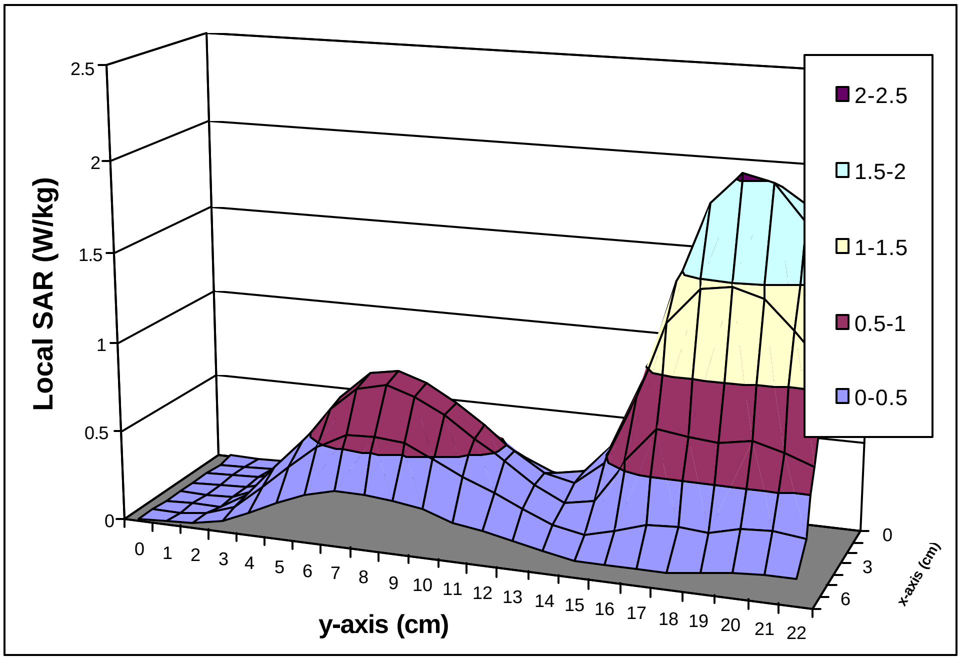

Figure 14. Surface Plot of the Reference Area Scan 2.5mm Above Phantom

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APPENDIX F. Duty Factor Limiting Algorithm for the OEM Radio Module R802D-2-O

The duty factor limiting algorithm for the OEM radio module R802D-2-O is a firmware algorithm that directly inhibits the radio firmware that generates transmit pulses. This algorithm will be permanently integrated with the radio firmware and installed at time of manufacture in the production facility. The algorithm cannot be modified or disabled by the user.

The radio module operates on a packet data network. The network controls the timing of most aspects of the radio signalling protocol. The shortest transmit event over which the mobile device has timing control is an entire uplink (transmit) transaction which is a series of transmit pulses. From the perspective of the mobile device this in an “atomic” event, i.e. the network controls the timing of the signalling within the transaction and the transaction can not be broken into smaller independent sub-parts.

Research in Motion Ltd. has implemented and tested a duty factor limiting algorithm for the radio module to comply with the requirement for limiting the duty factor at all times. To limit the duty factor at all times the algorithm controls the timing of when uplink (transmit) transactions are initiated. When an uplink (transmit) transaction occurs the algorithm accrues the actual transmit time. The algorithm ensures that the idle (transmitter off) time is sufficient to ensure the duty factor is less than the limit (25%) before the next uplink (transmit) transaction is initiated. This ensures that the duty factor is limited to the maximum allowable over all times.

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APPENDIX G. Duty Factor Limitation of Lipman Nurit 3010 POS

Lip LIPMAN U.S.A. Inc. *The Ideal Solution®*

50 Gordon Drive
Syosset, New York 11791

August 24, 2000

Federal Communications Commision
Equipment Authorization Branch
7435 Oakland Mills Road
Columbia, MD 21406

To Whom It May Concern:
A typical authorization financial transaction in the POS industry consists of approximately 100 bytes of request that is transmitted by the POS device and 50 bytes of response received by the POS device. The fastest transaction time that has been achieved on the Mobitex network was 3 seconds. A regular transaction time is about 6 seconds and it takes another 10 seconds before the next transaction can be run after swiping the next card and entering the amount.

To be conservative, we will still assume that we can transmit one transaction per 3 sec continuously. According to RIM, Mobitex transmits at a maximum of 8000 bytes per second which would be 24000 bytes in 3 seconds. The maximum duty factor is therefore 100 / 24000 = 0.00416 or 0.42%.

Some of the financial institutions may require the terminal to submit all transactions as a batch at the end of each day. During this batch upload terminal uploads all necessary transactions to the host computer.

The current maximum byte stream transmitted for a transaction in a batch upload is 250.

Assuming the worst condition situation, the terminal will submit one transaction (500 byte stream, double the size of current numbers) per 3 seconds. According to RIM, Mobitex transmits at a maximum of 8000 bytes per second which would be 24000 bytes in 3 seconds. The maximum duty factor is therefore 500 (bytes per trans) / 24000 = 0.0208 or 2.1%.

Sincerely,
Bulent Ozayaz
Chief Engineer

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