Amendment Test Report
Specific Absorption Rate (SAR)
for
Shinton Co., Ltd.
on the
Date Cellular Phone
Model Number: GDU325

Amendment Test Report: 20496071
Date of Report: May 17, 2001

Job #: J20049607
Date of Test: May 16, 2001

Original Test Report: 20407301
Date of Report: February 16, 2001

Total No of Pages Contained in this Report: 23

NVLAP Laboratory Code 200201-0
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Tested by:	Xi-Ming Yang
Reviewed by:	David Chernomordik, Ph.D., EMC Site Manager

Review Date: ________________

Table of Contents

1.0 Job description

This report is an Amendment to the original Test Report # 20407301 dated February 16, 2001. This Amendment Report covers the EUT tested in the body worn configuration.

1.1 Client Information

The Shinton GDU325 has been tested at the request of

Company: Shintom Co., Ltd
1-19-20 Shin-Yakoham, Kohoku-Ku
Yokohama 222-0033
Japan

Name of contact: Mr. Takeo Watanabe
Telephone: +81-45-476-3541
Fax: +81-45-476-3540

1.2 Equipment under test (EUT)

Product Descriptions:

Equipment	Dual Band Phone GSM 900/1900		
Trade Name	Shintom Co., Ltd	Model No	GDU325
FCC ID	BFYM5016	S/N No.	N/A
Category	Portable	RF Exposure	Uncontrolled Environment
Frequency Band	890– 915 MHz 1860 – 1910 MHz	System	GSM 900 GSM 1900 (PCS)
EUT Antenna Description			
Type	Monopole	Configuration	Fixed
Dimensions	23mm (L)	Gain	0 dBi
Location	Top, Right		

Use of Product : Voice Communication

Manufacturer: SAME as above.

Production is planned: [X] Yes, [ ] No

EUT receive date: May 16, 2001

EUT received condition: Good working condition prototype

Test end date: May 16, 2001

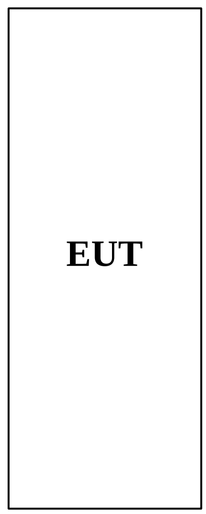
1.3 Test plan reference

FCC rule part 2.1093, FCC Docket 96-326 & Supplement C to OET Bulletin 65

1.4 System test configuration

1.4.1 System block diagram & Support equipment

The diagram shown below details test configuration of the equipment under test.



1.4.2 Test Position

The Shinton GDU325 was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in C95.1 (1992) and Supplement C of OET 65 (1998). Please refer to figure 1 below for the position details:

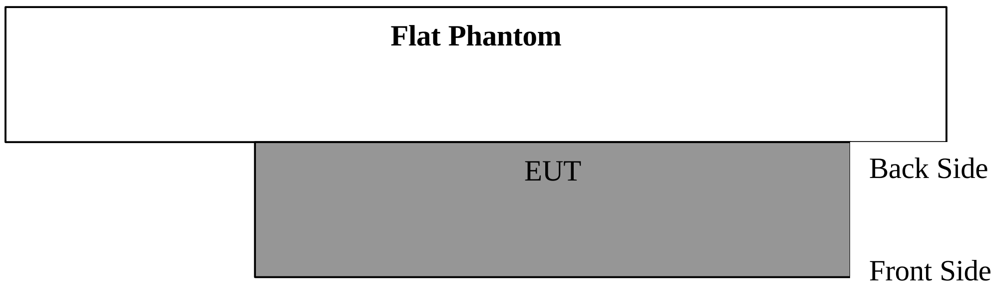


Figure 1: Intended use position for Muscle(Body Worn)

1.4.3 Test Condition

During tests, the worst case data (max. RF coupling) was determined with following conditions:

EUT Antenna	Fixed length	Orientation	Back of EUT touching phantom
Usage	Body	Distance between antenna axis at the joint and the liquid surface:	8mm
Simulating	Muscle	EUT Battery	Fully Charged battery
Power output - Maximum power at antenna port	32.0 dBm @ 900 MHz 29.0 dBm @ 1800 MHz 29.0 dBm @ 1900 MHz		

The spatial peak SAR values were accessed for lowest, middle and highest operating channels defined by the manufacturer.

Antenna port power measurement was performed by manufacturer.

1.5 Modifications required for compliance

No modifications were implemented by Intertek Testing Services.

1.6 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standard.

2.0 SAR EVALUATION

2.1 SAR Limits

The following FCC limits for SAR apply to devices operate in General Population/Uncontrolled Exposure environment:

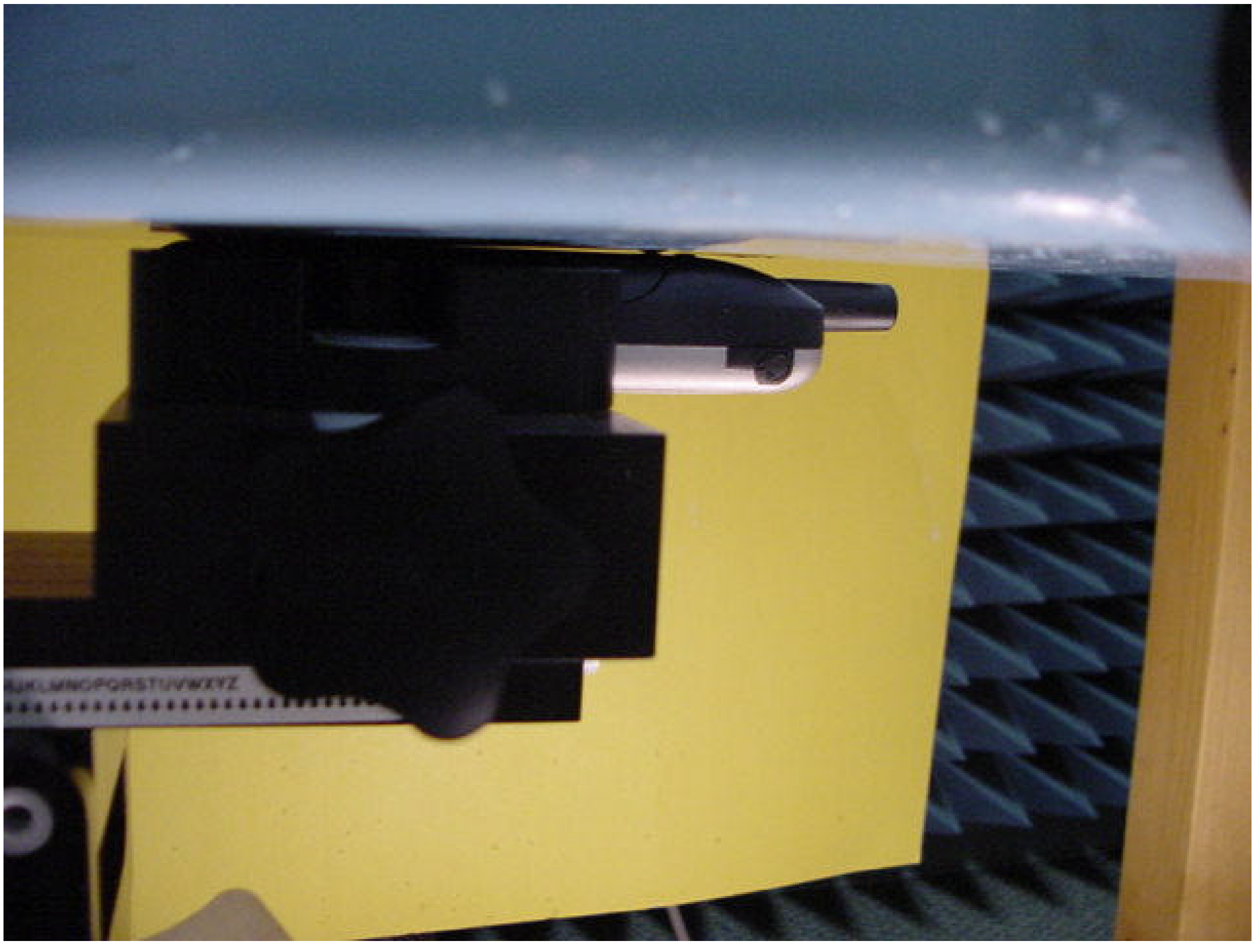
EXPOSURE (General Population/Uncontrolled Exposure environment)	**SAR (W/kg)**
Average over the whole body	0.08
Spatial Peak (1g)	1.60
Spatial Peak for hands, wrists, feet and ankles (10g)	4.00

2.2 Configuration Photographs

SAR measurement Test Setup

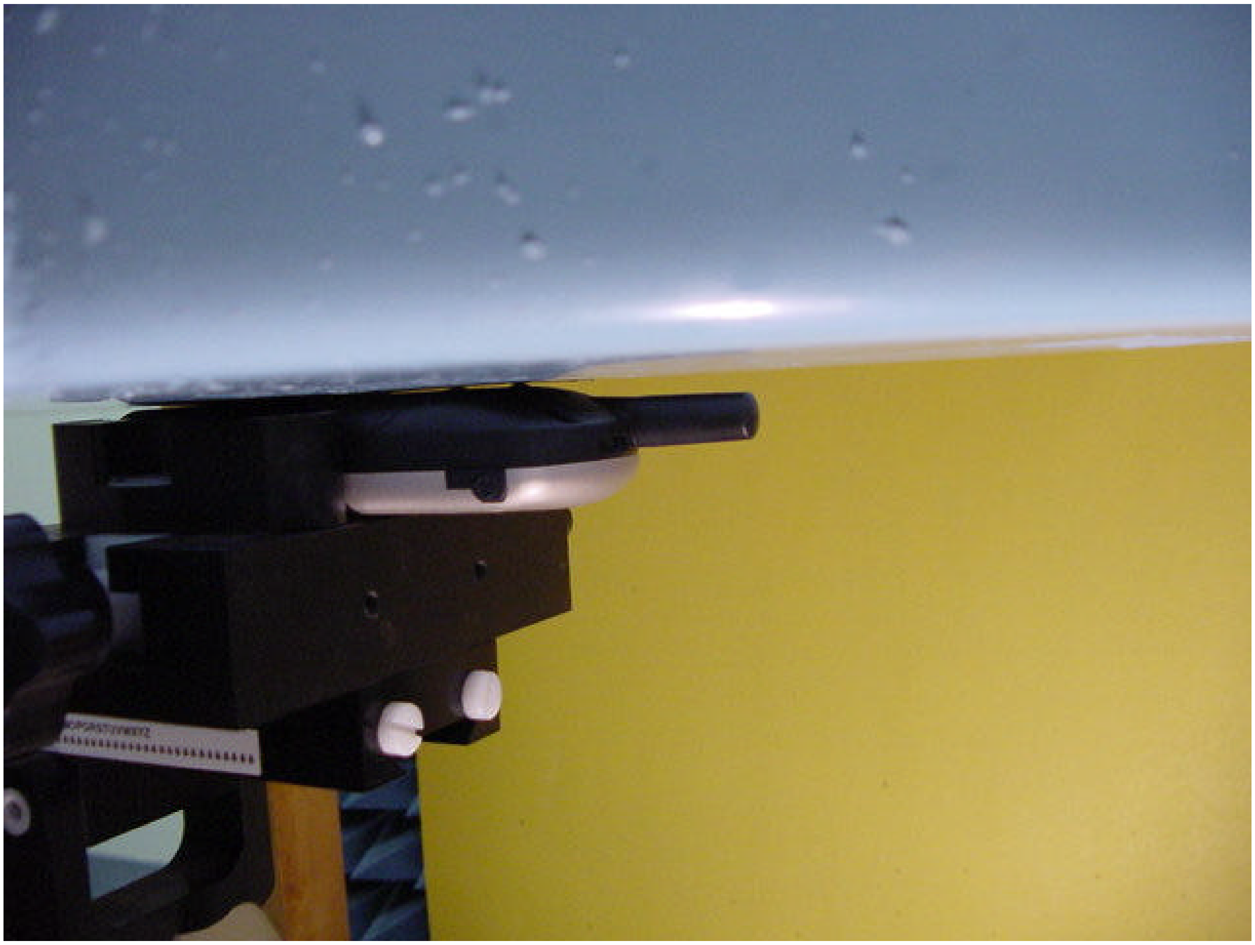
2.2 Configuration Photographs (Continued)

SAR measurement Test Setup



2.2 Configuration Photographs (Continued)

SAR measurement Test Setup



2.3 System Verification

Prior to the assessment, the system was verified to the ±5% of the specifications by using the system validation kit.

Validation kit	Targeted SAR_{1g} (mW/g)	Measured SAR_{1g} (mW/g)
D900V2, S/N #: 0013	4.03	3.92

2.4 Evaluation Procedures

The SAR evaluation was performed with the following procedures:

a. SAR was measured at a fixed location above the reference point and used as a reference value for the assessing the power drop.

b. The SAR distribution at the exposed side of the flat Phantom was measured at a distance of 30 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20 mm x 20 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

c. Around this point, a volume of 32 mm x 32 mm x 34 mm was assessed by measuring 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

   i) The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measurement point is 1.6 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in Z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

   ii) The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum, the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3-D spline interpolation algorithm. The 3-D spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y and z directions). The volume was integrated with the trapezoidal algorithm. 1000 points (10 x 10 x 10) were interpolated to calculate the average.

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

d. Re-measurement of the SAR value at the same location as in step a. above. If the value changed by more than 5 %, the evaluation was repeated.

2.5 Test Results

The results on the following page(s) were obtained when the device was tested in the condition described in this report. Detail measurement data and plots, which reveal information about the location of the maximum SAR with respect to the device, are reported in Appendix A.

Measurement Results

Trade Name:	Shinton Co., Ltd.	**Model No.:**	Shinton GDU325
Serial No.:	Not Labeled	**Test Engineer:**	Xi-Ming Yang

TEST CONDITIONS			
Ambient Temperature	21.7 ^{o}C	Relative Humidity	44 %
Test Signal Source	Test Mode	Signal Modulation	GSM
Output Power Before SAR Test	32.4 dBm in 900 MHz band 29.5 dBm in 1800 MHz band	Output Power After SAR Test	The Same
Test Duration	23 Min. each test	Number of Battery Change	Every Scan

EUT Position: Back of EUT flat against phantom				
Channel MHz	**Operating Mode**	**Crest Factor**	**Measured SAR_{1g} (mW/g)**	**Plot Number**
1850	GSM	8	0.746	1
1880	GSM	8	0.834	2
1910	GSM	8	0.961	3
890.2	GSM	8	0.752	4
902.4	GSM	8	0.649	5
914.8	GSM	8	0.574	6

Note: a) Worst case data were reported
b) Duty cycle factor included in the measured SAR data
c) Uncertainty of the system is not included

3.0 TEST EQUIPMENT

3.1 Equipment List

The Specific Absorption Rate (SAR) tests were performed with the SPEAG model DASY 3 automated near-field scanning system which is package optimized for dosimetric evaluation of mobile radios [3].

The following major equipment/components were used for the SAR evaluations:

SAR Measurement System			
EQUIPMENT	SPECIFICATIONS	S/N #	CAL. DATE
Robot	**Stäubi RX60L**	597412-01	N/A
	Repeatability: ± 0.025mm Accuracy: 0.806×10^{-3} degree Number of Axes: 6		
E-Field Probe	**ET3DV5**	1333	4/23/01
	Frequency Range: 10 MHz to 6 GHz Linearity: ± 0.2 dB Directivity: ± 0.1 dB in brain tissue		
Data Acquisition	**DAE3**	317	N/A
	Measurement Range: 1µV to >200mV Input offset Voltage: < 1µV (with auto zero) Input Resistance: 200 M		
Phantom	**Generic Twin V3.0**	N/A	N/A
	Type: Generic Twin, Homogenous Shell Material: Fiberglass Thickness: 2 ± 0.1 mm Capacity: 20 liter Ear spacer: 4 mm (between EUT ear piece and tissue simulating liquid)		
Simulated Tissue	**Mixture**	N/A	5/16/01
	Please see section 6.2 for details		
Power Meter	**HP** 8900D w/ 84811A sensor	1312A01255	8/01/00
	Frequency Range: 100kHz to 18 GHz Power Range: 300µW to 3W		

3.2 Tissue Simulating Liquid

Muscle	
Ingredient	**Frequency** (900 MHz)
Water	54.05 %
Sugar	45.75 %
Salt	0.1 %
Preservative	0.1 %

The dielectric parameters were verified prior to assessment using the HP 85070A dielectric probe kit and the HP 8753C network Analyzer. The dielectric parameters were:

Frequency (MHz)	$_{r}$ *	*(mho/m)	**(kg/m$^{3)}$
835	48.4 ± 5%	0.92 ± 10%	1000

* *worst case uncertainty of the HP 85070A dielectric probe kit*
** *worst case assumption*

Muscle	
Ingredient	**Frequency** (1900 MHz)
Water	54.5 %
Cellulose	0.1 %
Salt	0 %
Preservative	0.1 %
Sugar	45.3 %

The dielectric parameters were verified prior to assessment using the HP 85070A dielectric probe kit and the HP 8753C network Analyzer. The dielectric parameters were:

Frequency (MHz)	$_{r}$ *	*(mho/m)	**(kg/m$^{3)}$
1900	52.5 ± 5%	1.61 ± 10%	1000

* *worst case uncertainty of the HP 85070A dielectric probe kit*
** *worst case assumption*

Note: The amount of each ingredient specified in the tables are not the exact amounts of the final test solution. The final test solution was adjusted by adding small amounts of either water, sugar, and/or salt to calibrate the solution to meet the proper dielectric parameters.

3.3 E-Field Probe Calibration

Probes were calibrated by the manufacturer in the TEM cell ifi 110. To ensure consistency, a strict protocol was followed. The conversion factor (ConF) between this calibration and the measurement in the tissue simulation solution was performed by comparison with temperature measurement and computer simulations. Probe calibration factors are included in Appendix C.

3.4 Measurement Uncertainty

The uncertainty budget has been determined for the DASY3 measurement system according to the NIS81 [5] and the NIST 1297 [6] documents and is given in the following table. The extended uncertainty (K=2) was assessed to be 23.5 %

UNCERTAINTY BUDGET				
Uncertainty Description	**Error**	**Distrib.**	**Weight**	**Std.Dev.**
Probe Uncertainty				
Axial isotropy	±0.2 dB	U-shape	0.5	±2.4 %
Spherical isotropy	±0.4 dB	U-shape	0.5	±4.8 %
Isotropy from gradient	±0.5 dB	U-shape	0	
Spatial resolution	±0.5 %	Normal	1	±0.5 %
Linearity error	±0.2 dB	Rectang.	1	±2.7 %
Calibration error	±3.3 %	Normal	1	±3.3 %
SAR Evaluation Uncertainty				
Data acquisition error	±1 %	Rectang.	1	±0.6 %
ELF and RF disturbances	±0.25 %	Normal	1	±0.25 %
Conductivity assessment	±10 %	Rectang.	1	±5.8 %
Spatial Peak SAR Evaluation Uncertainty				
Extrapol boundary effect	±3 %	Normal	1	±3 %
Probe positioning error	±0.1 mm	Normal	1	±1 %
Integrat. and cube orient	±3 %	Normal	1	±3 %
Cube shape inaccuracies	±2 %	Rectang.	1	±1.2 %
Device positioning	±6 %	Normal	1	±6 %
Combined Uncertainties				**±11.7 %**

3.5 Measurement Tractability

All measurements described in this report are traceable to National Institute of Standards and Technology (NIST) standards or appropriate national standards.

4.0 REFERENCES

[1] ANSI, *ANSI/IEEE C95.1-1991: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz*, The Institute of electrical and Electronics Engineers, Inc., New York, NY 10017, 1992

[2] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", OET Bulletin 65, FCC, Washington, D.C. 20554, 1997

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, "Automated E-field scanning system for dosimetric assessments", *IEEE Transaction on Microwave Theory and Techniques*, vol. 44, pp. 105-113, Jan. 1996.

[4] Niels Kuster, Ralph Kastle, and Thomas Schmid, "Dosimetic evaluation of mobile communications equipment with know precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp.645-652, May 1997.

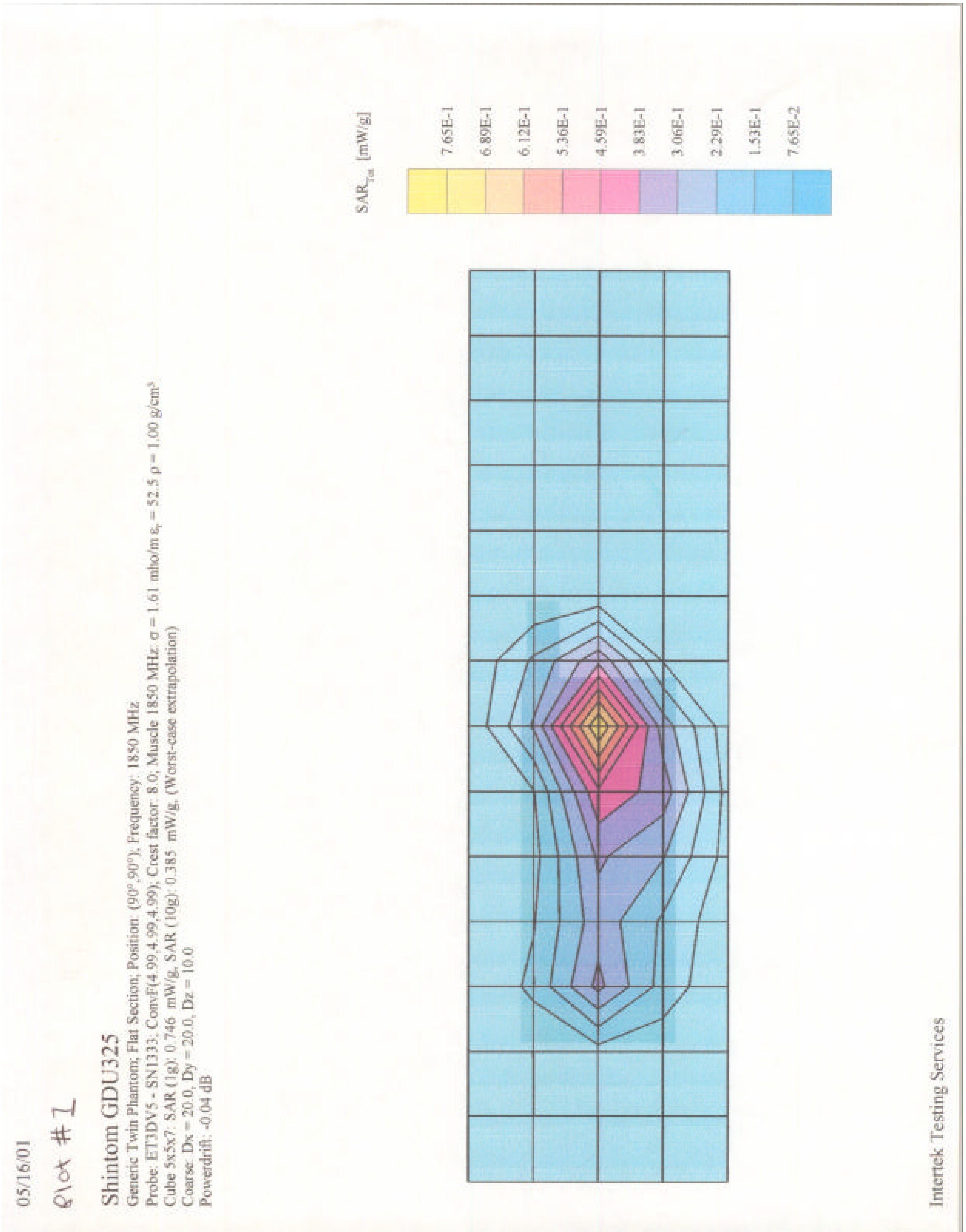
[5] NIS81, NAMAS, "The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddinton, Middlesex, England, 1994.

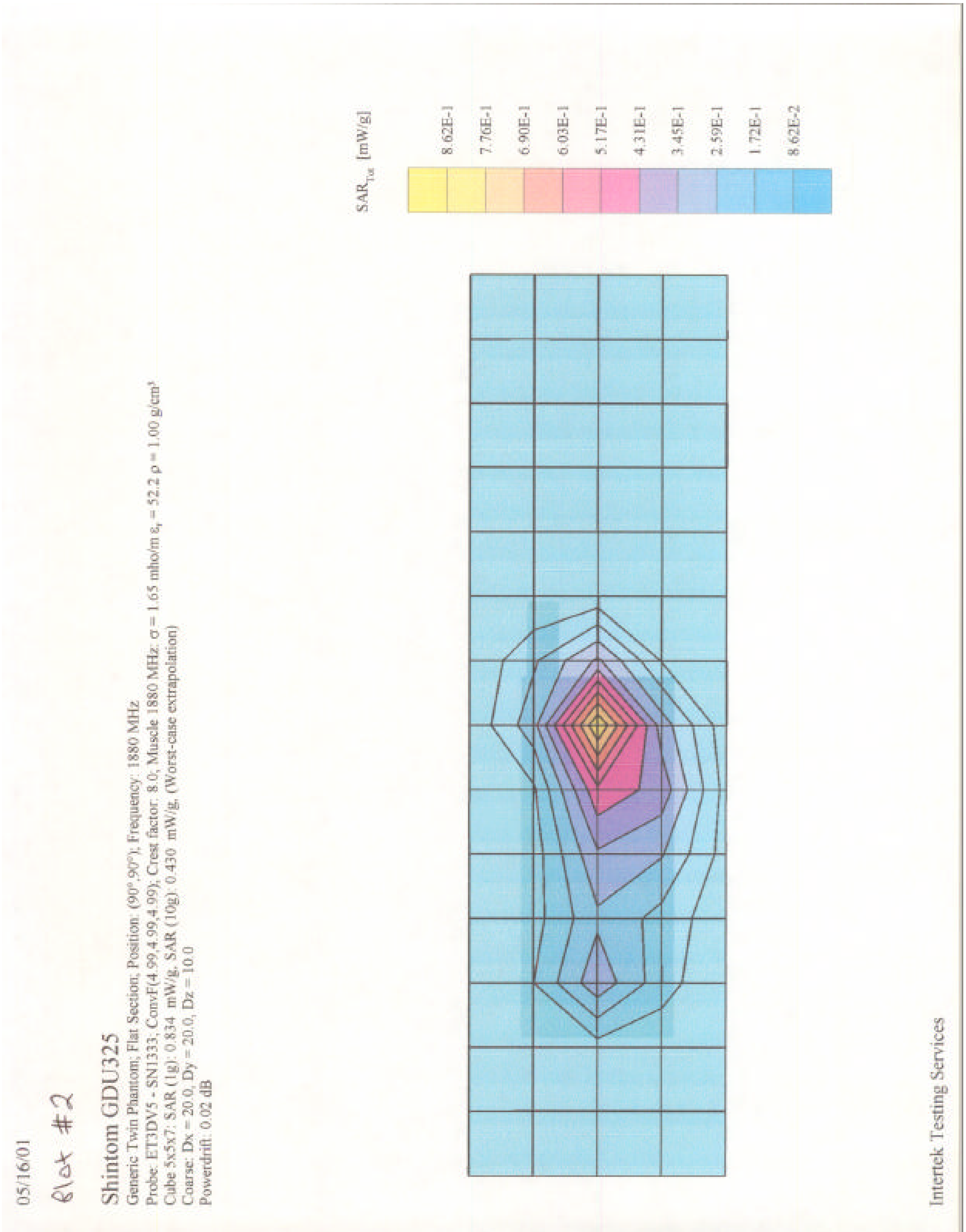
[6] Barry N. Tayor and Chris E. Kuyatt, "Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994.

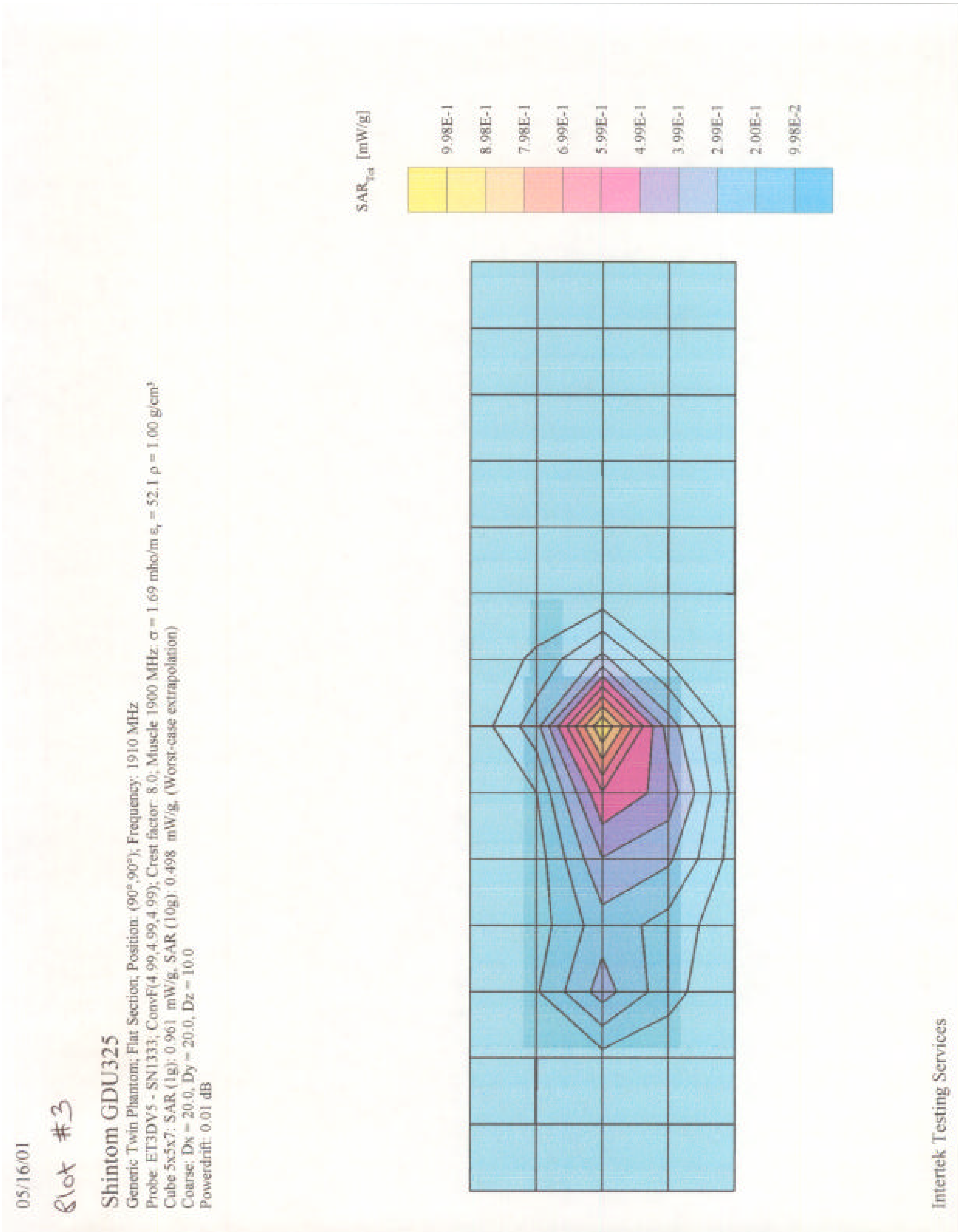
APPENDIX A - SAR Evaluation Data

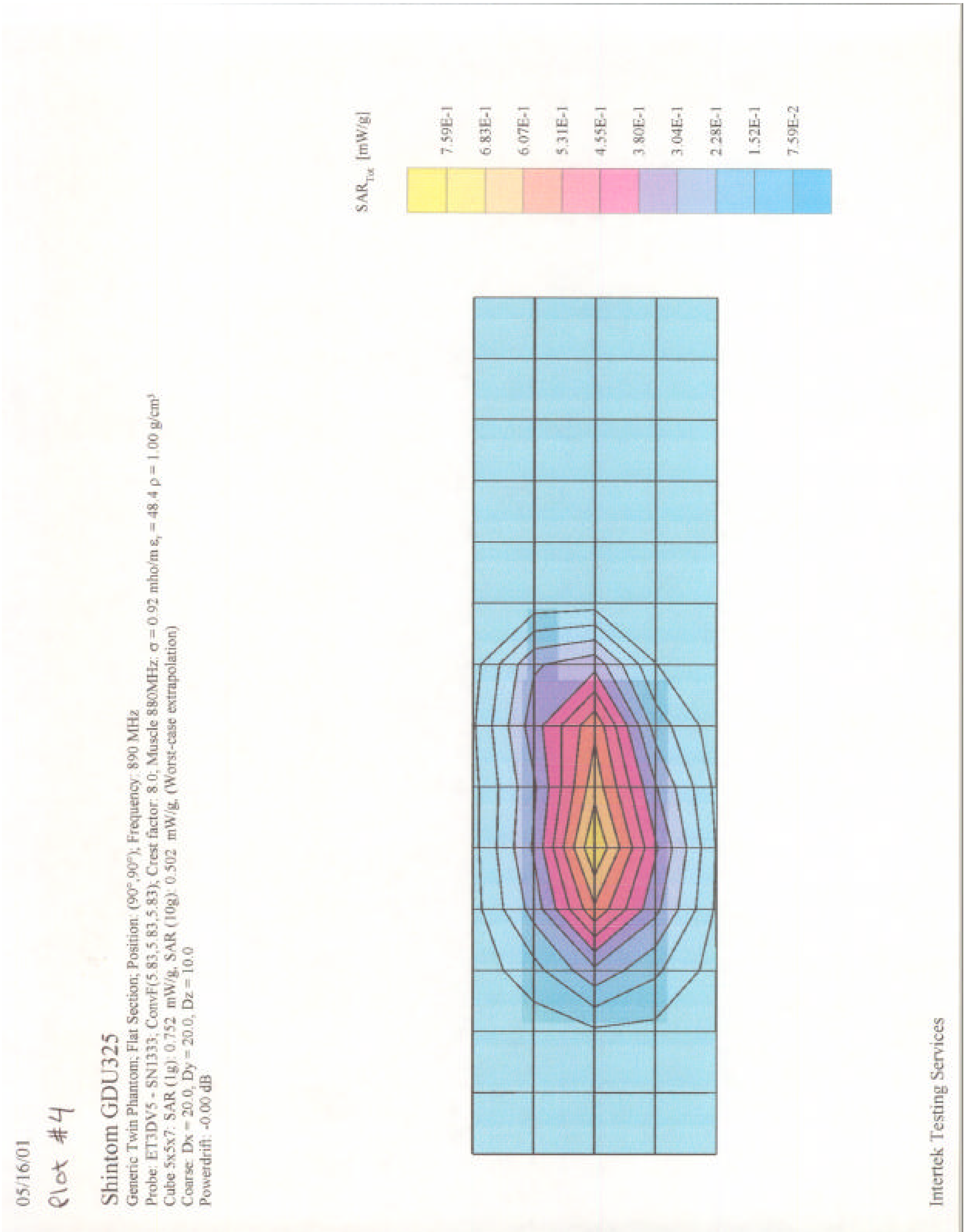
Please note that the graphical visualization of the phone position onto the SAR distribution gives only limited information on the current distribution of the device, since the curvature of the head results in graphical distortion. Full information can only be obtained either by H-field scans in free space or SAR evaluation with a flat phantom.

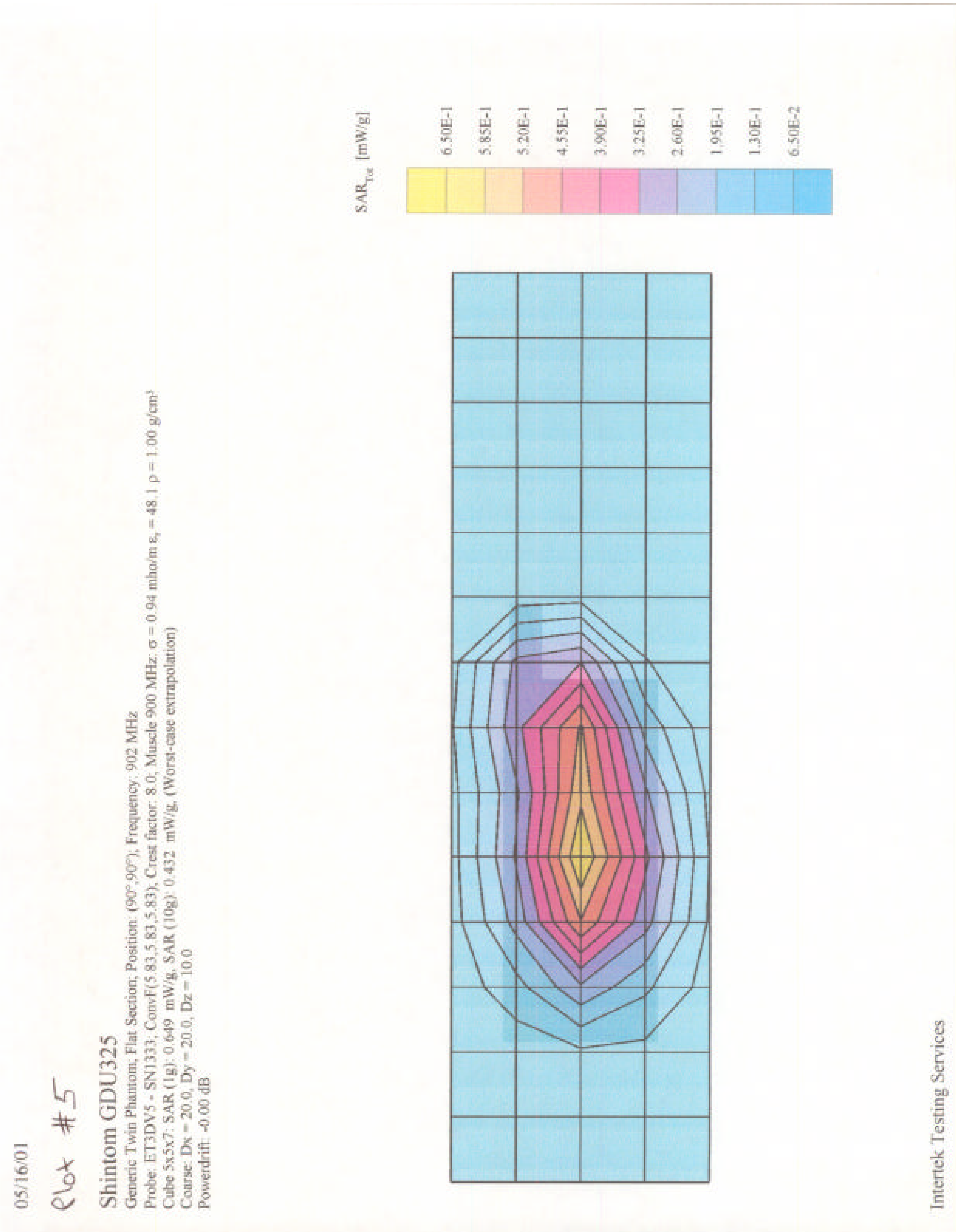
Powerdrift is the measurement of power drift of the device over one complete SAR scan.

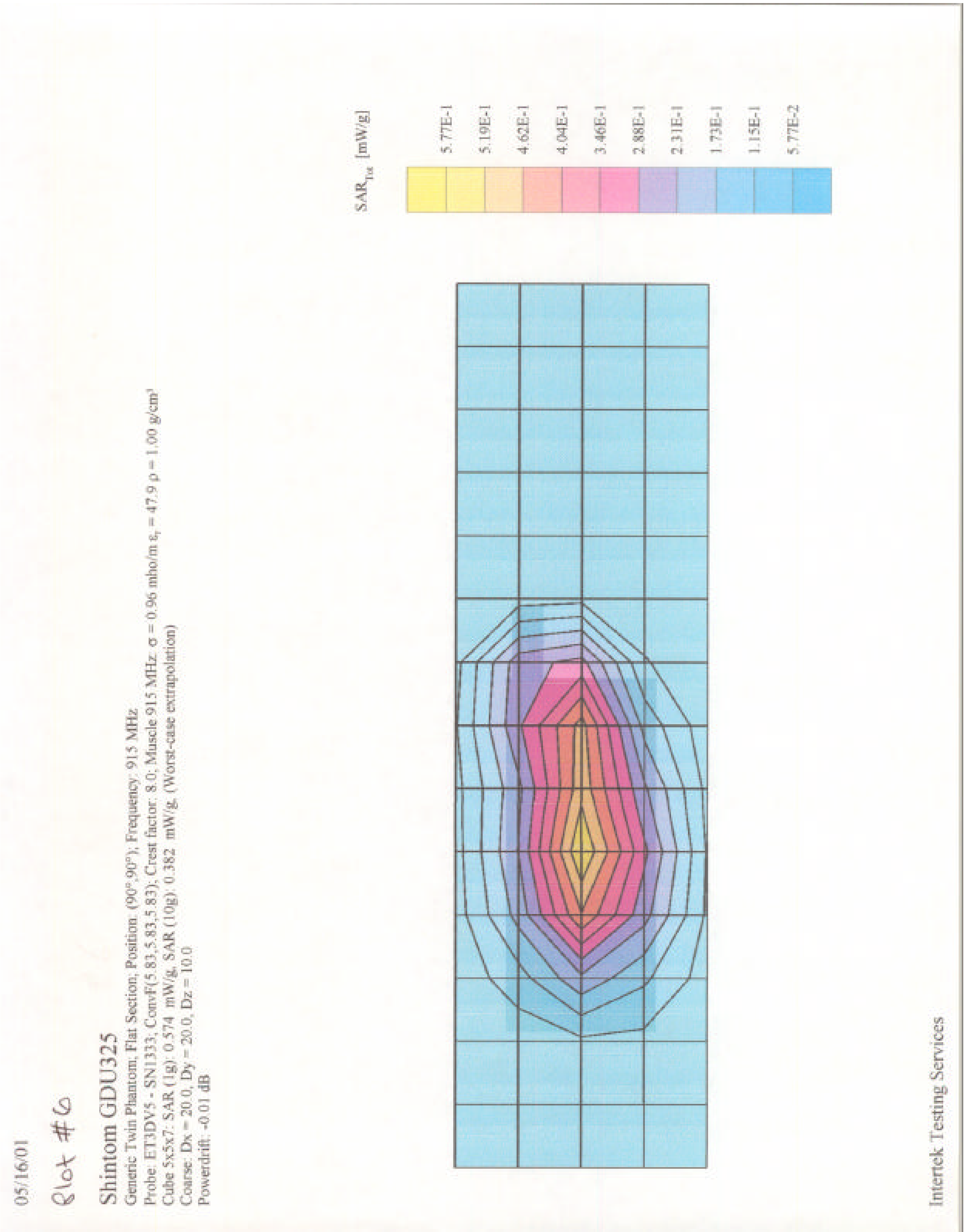

05/16/01
Plot #1
Shintom GDU325
Generic Twin Phantom; Flat Section; Position: (90°,90°); Frequency: 1850 MHz
Probe: ET3DV5 - SN1333; ConvF(4.99,4.99,4.99); Crest factor: 8.0; Muscle 1850 MHz: σ = 1.61 mho/m εr = 52.5 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.746 mW/g, SAR (10g): 0.385 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.04 dB
SAR_Tot [mW/g]
7.65E-1
6.89E-1
6.12E-1
5.36E-1
4.59E-1
3.83E-1
3.06E-1
2.29E-1
1.53E-1
7.65E-2
Intertek Testing Services


05/16/01
Plot #2
Shintom GDU325
Generic Twin Phantom; Flat Section; Position: (90°,90°); Frequency: 1880 MHz
Probe: ET3DV5 - SN1333; ConvF(4.99,4.99,4.99); Crest factor: 8.0; Muscle 1880 MHz: σ = 1.65 mho/m εr = 52.2 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.834 mW/g, SAR (10g): 0.430 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.02 dB
SARTot [mW/g]
8.62E-1
7.76E-1
6.90E-1
6.03E-1
5.17E-1
4.31E-1
3.45E-1
2.59E-1
1.72E-1
8.62E-2
Intertek Testing Services


05/16/01
Plot #3
Shintom GDU325
Generic Twin Phantom; Flat Section; Position: (90°,90°); Frequency: 1910 MHz
Probe: ET3DV5 - SN1333; ConvF(4.99,4.99,4.99); Crest factor: 8.0; Muscle 1900 MHz: σ = 1.69 mho/m εr = 52.1 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.961 mW/g, SAR (10g): 0.498 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: 0.01 dB
SAR_Tot [mW/g]
9.98E-1
8.98E-1
7.98E-1
6.99E-1
5.99E-1
4.99E-1
3.99E-1
2.99E-1
2.00E-1
9.98E-2
Intertek Testing Services


05/16/01
Plot #4
Shintom GDU325
Generic Twin Phantom; Flat Section; Position: (90°,90°); Frequency: 890 MHz
Probe: ET3DV5 - SN1333; ConvF(5.83,5.83,5.83); Crest factor: 8.0; Muscle 880MHz: σ = 0.92 mho/m εr = 48.4 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.752 mW/g, SAR (10g): 0.502 mW/g, (Worst-case extrapolation)
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.00 dB
SAR_Tot [mW/g]
7.59E-1
6.83E-1
6.07E-1
5.31E-1
4.55E-1
3.80E-1
3.04E-1
2.28E-1
1.52E-1
7.59E-2
Intertek Testing Services


05/16/01
Plot #5
Shintom GDU325
Generic Twin Phantom; Flat Section; Position: (90°,90°); Frequency: 902 MHz
Probe: ET3DV5 - SN1333; ConvF(5.83,5.83,5.83); Crest factor: 8.0; Muscle 900 MHz: σ = 0.94 mho/m ε_r = 48.1 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.649 mW/g, SAR (10g): 0.432 mW/g, (Worst-case extrapolation)
Course: Dx = 20.0, Dy = 20.0, Dz = 10.0
Powerdrift: -0.00 dB
SAR_Tot [mW/g]
6.50E-1
5.85E-1
5.20E-1
4.55E-1
3.90E-1
3.25E-1
2.60E-1
1.95E-1
1.30E-1
6.50E-2
Intertek Testing Services



5.0 DOCUMENT HISTORY

Revision/ Job Number	**Writer Initials**	**Date**	**Change**
1.0 /J20049607	OM	May 17, 2001	Original document