



MOTOROLA



CGISS EME Test Laboratory

8000 West Sunrise Blvd
Fort Lauderdale, FL. 33322

S.A.R. EME Compliance Test Report

Attention: Federal Communication Commission
Date of Report: May 22, 2002
Report Revision: Rev. O
Device Manufacturer: Motorola
Device Description: Wireless Data Device with GPRS
FCC ID: AZ489FT7002
Device Model: F4413A

Test Period: 1/3/02 – 1/10/02

Test Engineer: Stephen Whalen
Sr. Test Engineer

Author: Michael Sailsman
EME Regulatory Affairs Liaison

Note: Based on the information and the testing results provided herein, the undersigned certifies that when used as stated in the operating instructions supplied, said product complies with the national and international reference standards and guidelines listed in section 2.0 of this report.

Ken Enger

Senior Resource Manager, Product Safety and EME Director

Date Approved

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REVISION HISTORY

Date	Revision	Comments
5/22/02	O	Initial release

1.0 Introduction

This report details the utilization, test setup, test equipment, and test results of the Specific Absorption Rate (S.A.R.) measurements performed at the CGISS EME Test Lab for the hand held data terminal with GPRS, model number F4413A, FCC ID AZ489FT7002.

The applicable exposure environment is General Population/Uncontrolled.

The test results included herein represent the highest S.A.R. levels applicable to this product and clearly demonstrate compliance with FCC General Population/Uncontrolled RF Exposure limits of 1.6 mW/g per the requirements of 47 CFR 2.1093(d).

2.0 Reference Standards and Guidelines

This product is designed to comply with the following national and international standards and guidelines.

- United States Federal Communications Commission, Code of Federal Regulations; 47CFR part 2 sub-part J
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998
- Ministry of Health (Canada) Safety Code 6. Limits of Human Exposure to Terminal frequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, 1999
- Australian Communications Authority Terminal communications (Electromagnetic Radiation - Human Exposure) Standard 2001
- ANATEL, Brazil Regulatory Authority, Resolution 256 (April 11, 2001) "additional requirements for SMR, cellular and PCS product certification."

3.0 Description of Test Sample



Model F4413A is a hand held or body worn data terminal with GPRS functionality. The terminal's intended use will be for data acquisition during delivery of packages. The data terminal is operated while being held by its handle, within a recommended user's holster, or while placed on top of a parcel.

The device transmits and receives data exclusively using a radio modem data terminal (g18) that operates on the GPRS communication network. The device transmits and receives data intermittently. The transmission bursts have an average duration of approximately three seconds. Transmission and reception of data can occur without user initiation. The total number of transmission events during a normal day is expected to range between 40 and 150. The device is intended to be in a fixed location in a vehicle when not being operated by the user and is intended to be operated any where inside the vehicle once the vehicle is stationary.

The maximum power outputs and the transmit frequency ranges for the data terminal are 2W pulsed averaged for EGSM (880.2 – 914.8MHz), 1W pulsed averaged for DCS 1800 (1710 – 1784.8MHz) and PCS 1900 (1850.2 – 1909.8MHz). All bands operate using TDMA 1:8 transmit duty cycle.

The data terminal is offered with the following options and accessories:

Batteries

FNN5101A 7.2V/ 2400 mAh Lithium Ion Rechargeable battery

Body-Worn Accessories

UPS192010 UPS personal Carrying bag for Europe only

Other

FPN1520A Battery Charger

3.1 Test Signal

Test Signal mode

Test Mode	☒	Base Station	☐	Simulator	☐
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Transmission Mode

CW	☐
Native Transmission	☐
TDMA 1:8	X
EGSM, DCS, PCS	X

3.2 Test Output Power

This data terminal uses an inaccessible internal antenna. For this reason a power vs. time characteristic curve was measured for a time interval greater than the expected S.A.R. measurement duration. This curve is then used to determine the power slump characteristics at the actual end time of the S.A.R. measurement. Tables of the characteristic curves for each mode of operation can be found in Appendix A.

4.0 Description of Test Equipment

4.1 Descriptions of SAR Measurement System

The laboratory utilizes a Dosimetric Assessment System (DASY3™) S.A.R. measurement system manufactured by Schmid & Partner Engineering AG (SPEAG™), of Zurich Switzerland. The S.A.R. measurements were conducted with probe model/serial number ET3DV6/SN1393. The system performance check was conducted daily and within 24 hours prior to testing. A copy of the DASY output files of the system performance test results and the probe calibration certificates are included in APPENDIX C and D respectively. The table below summarizes the system performance check results normalized to 1W.

Probe Serial #	Tissue Type	Probe Cal Date	Dipole Kit / Serial #	System Perf. Result when normalized to 1W (mW/g)	Reference SAR @ 1W (mW/g)	Test Date
1393	IEEE Body	4/23/01	D900 V2 SN-085	11.73 +/- 0.09	10.8	1/3/02 to 1/4/02
1393	IEEE Body	4/23/01	D1800 V2 SN 278	40.42 +/- 0.38	38.1	1/4/02 to 1/10/02

The DASY3™ system is operated per the instructions in the DASY3™ Users Manual. The complete manual is available directly from SPEAG™.

4.2 Description of Phantom

4.2.1 Body Phantom

Flat Phantom

A rectangular shaped box made of white glycol resistant plastic and is mounted on a wooden supporting structure that has a loss tangent of < 0.05. The structure has a 68.58 cm x 25.4 cm opening at its center to allow positioning the DUT to the phantom's surface. The supporting structure is assembled with wooden pegs and glue. The table below shows the flat phantom dimensions.

Length	80cm
Width	30cm
Height	20cm
Surface Thickness	0.2cm

4.3 Simulated Tissue Properties

4.3.1 Type of Simulated Tissue

The simulated tissue used is compliant to that specified in FCC Supplement C (Edition 01 - 01) to OET Bulletin 65 (Edition 97 - 01).

Simulated Tissue	Body Position
Body	Abdomen

4.3.2 Simulated Tissue Composition

BODY Formulas (% by weight)						
Frequency	Sugar	DGBE	Water	Salt	HEC	Bact.
900	44.9	NA	53.06	0.94	1	0.1
1800	NA	30.8	68.8	0.4	NA	NA
1900	NA	30.8	68.91	0.29	NA	NA

Characterization of Simulated tissue materials and ambient conditions:

Simulated tissue prepared for S.A.R. measurements is measured daily and within 24 hours prior to actual S.A.R. testing to verify that the tissue is within 5% of target parameters at the center of the transmit band. This measurement is done using the Agilent (HP) probe kit model 85070C and a HP8753D Network Analyzer.

Target tissue parameters

Frequency (MHz)	FCC Body	
	Di-electric Constant	Conductivity – S/m
900	55.0	1.05
1747	53.44	1.49
1880	53.30	1.52

4.4 Test conditions

The EME Laboratory ambient environment is well controlled resulting in very stable simulated tissue temperature and therefore stable dielectric properties. Simulated tissue temperature is measured prior to each scan to insure it is within $\pm 2^{\circ}\text{C}$ of the temperature at which the dielectric properties were determined. Additional precautions are routinely taken to ensure the stability of the simulated tissue such as covering the phantoms when scans are not actively in process in order to minimize evaporation. The lab environment is continuously monitored. The table below represents the average environmental conditions during the S.A.R. tests reported herein:

Ambient Temperature	22.2 °C
Relative Humidity	41.7 %
Tissue Temperature	20.8 °C

The EME Lab RF environment uses a Spectrum Analyzer to monitor for extraneous large signal RF contaminants that could possibly affect the test results. If such unwanted signals are discovered the S.A.R. scans are repeated. However, the lab environment is sufficiently protected such that no S.A.R. impacting interference has been experienced to date.

5.0 Description of Test Procedure

All options and accessories listed in section 3.0 were included in the S.A.R. test plan in order to determine the highest S.A.R. levels. The maximum power outputs for the F4412A data terminal are 2 watts for E-GSM, and 1 watt for DCS1800 MHz and PCS 1900MHz bands. The transmit power of the test device was set to the maximum limit defined by the factory tuning procedures. The EUT was tested at the low, middle, and high frequencies for each of its transmit bands. The EUT has a fixed internal antenna. A power versus time characteristic curve was generated on the radio for a time interval greater than the expected S.A.R. measurement duration. This curve was then used to indicate the initial and end power for each test. Each S.A.R. scan was taken with a fully charged battery.

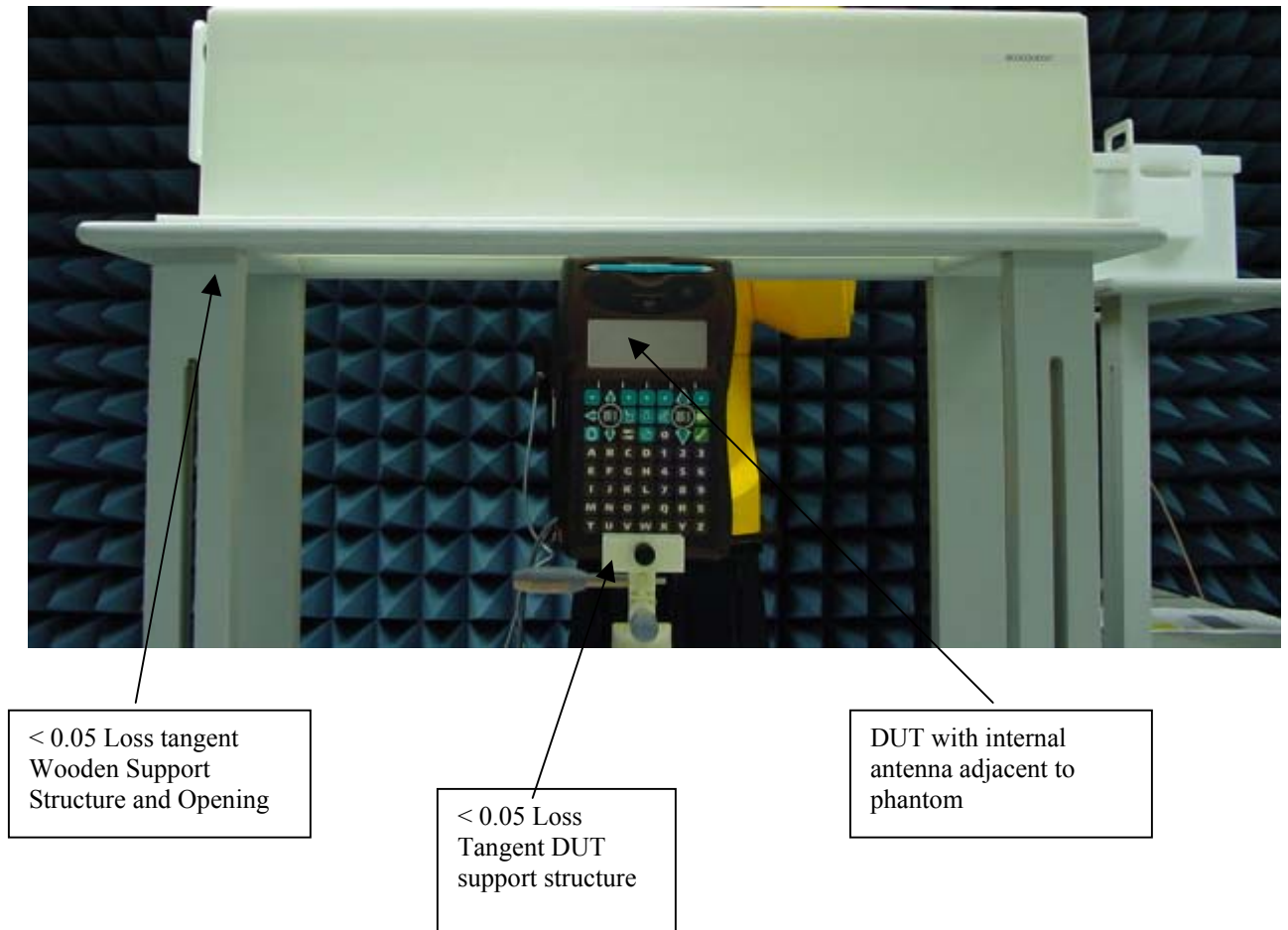
5.1 Device Test Positions

Reference figure 1 for the device orientation and position which exhibited the highest S.A.R. performance. Figure 2 depicts an overall perspective of the system setup and support structure.

5.1.1 Abdomen

A flat phantom containing simulated body tissue consistent with applicable standards was used to assess S.A.R. performance of the device.

Figure 1: Highest S.A.R. Test Configuration (Top edge of device against phantom)



Additional Test Configuration Photos

Figure 2: Device's display towards phantom

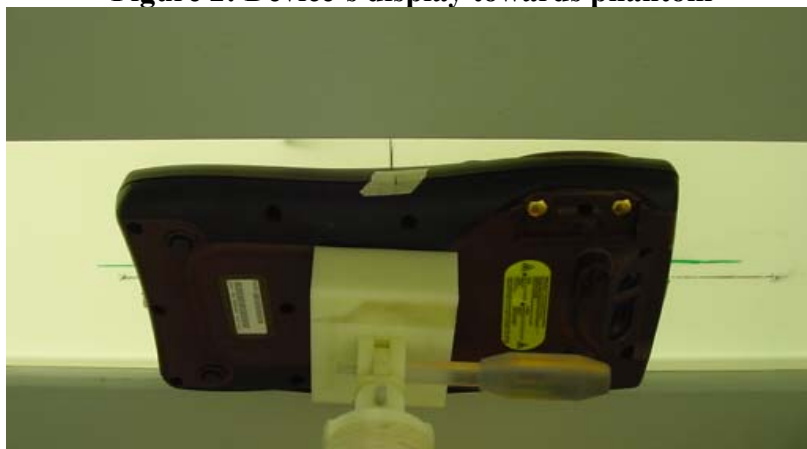


Figure 3: Device's bottom side (battery) towards the phantom



Figure 4: Device's side towards the phantom



Figure 5: Device's back (scanner) towards the phantom



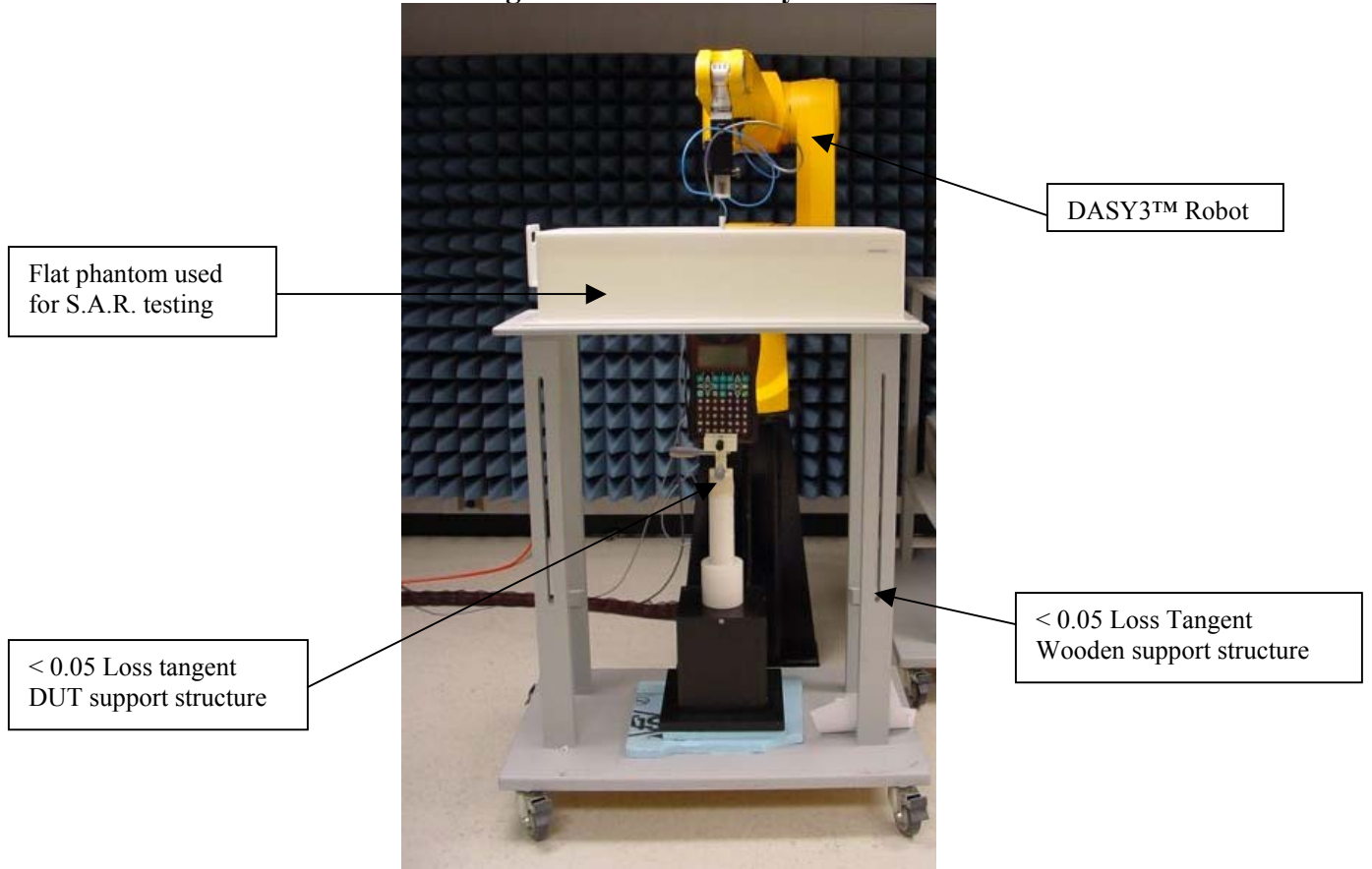
Figure 6: Device with display towards phantom in body worn accessory



Figure 7: Device with scanner towards phantom in body worn accessory



Figure 8: Robot Test System



5.2 Probe Scan Procedures

The E-field probe is first scanned in a coarse grid over a large area inside the phantom in order to locate the interpolated maximum S.A.R. distribution. After the coarse scan measurement, the probe is automatically moved to a position at the interpolated maximum. The subsequent scan can directly use this position as reference for the cube evaluations.

6.0 Measurement Uncertainty

The table below lists the uncertainty estimate of the possible errors that are associated with the measurement system.

Uncertainty Description	Standard Uncertainty
Probe Uncertainty	
- Axial Isotropy	$\pm 2.4 \%$
- Spherical Isotropy	$\pm 4.8 \%$
- Spatial Resolution	$\pm 0.5 \%$
- Linearity Error	$\pm 2.7 \%$
- Calibration Error	$\pm 8 \%$
Evaluation Uncertainty	
- Data Acquisition Error	$\pm 0.60 \%$
- ELF and RF Disturbances	$\pm 0.25 \%$
- Conductivity Assessment	$\pm 5 \%$
Spatial Peak S.A.R. Evaluation Uncertainty	
- Extrapolation and boundary effects	$\pm 3\%$
- Probe positioning	$\pm 1 \%$
- Integration and cube orientation	$\pm 3 \%$
- Cube shape inaccuracies	$\pm 1.2 \%$
- Device positioning	$\pm 1.0 \%$

The Total Measurement Uncertainty is $\pm 12.1 \%$. The Expanded Measurement Uncertainty is $\pm 24.2 \%$ ($k=2$)

Note: Per item #13 of the *OET 65 Supplement C EAB Part 22/24 S.A.R. Review Reminder Sheet 01/2002* handed out during the February and April, 2002 TCB council meeting the tabulated total measurement uncertainty is nominal until the IEEE Std 1528 is completed. Much of the required information has to be supplied by the equipment manufacturer, which has not yet been officially supplied. Other items are based on results of studies currently underway.

7.0 S.A.R. Test Results

All S.A.R. results obtained by the tests described in Section 5.0 are listed in section 7.1 below. The bolded result indicates the highest observed S.A.R. performance for each test configuration. DASY3™ S.A.R. measurement scans are provided in APPENDIX B for the highest observed S.A.R.

7.1 S.A.R. results at the abdomen

Test Position	Run Number	Freq. (MHz)	Battery	Carry Case	Initial Power (mW)	End Power (mW)	Measured 1g-SAR TDMA 8:1 (mW/g)
S.A.R. assessment in E-GSM mode. Display/battery against the phantom							
Display towards phantom	Ab_R1_020104-04	880	FNN5101A	None	1.9	1.92	0.71
Display towards phantom	Ab_R1_020103-06	902	FNN5101A	None	1.87	1.87	0.65
Display towards phantom	Ab_R1_020104-05	914	FNN5101A	None	1.86	1.87	0.75
Display towards phantom	Ab_R1_020104-06	914	FNN5101A	UPS192010	1.86	1.87	0.68
Battery towards phantom	Ab_R1_020104-02	902	FNN5101A	None	1.87	1.88	0.001
S.A.R. assessment E-GSM mode Top/Left/Right against the phantom							
Top edge towards phantom	Ab_R1_020104-03	902	FNN5101A	None	1.87	1.88	0.20
Left side to phantom	Ab_R1_001203-08	902	FNN5101A	None	1.87	1.87	0.04
Right side to phantom	Ab_R1_020103-07	902	FNN5101A	None	1.87	1.87	0.13
S.A.R. assessment DCS mode. Display/battery/scanner against the phantom							
Display towards phantom	Ab_R1_020107-02	1747	FNN5101A	None	0.98	0.95	0.40
Battery towards phantom	Ab_R1_020107-06	1747	FNN5101A	None	0.98	0.97	0.03
Scanner towards phantom	Ab_R1_0204-08	1747	FNN5101A	None	0.98	0.95	0.52
S.A.R. assessment DCS mode Top/Left/Right against the phantom							
Top edge towards phantom	Ab_R1_020107-05	1747	FNN5101A	None	0.98	0.97	0.72
Top edge towards phantom	Ab_R1_020108-07	1710	FNN5101A	None	0.99	0.99	0.77
Top edge towards phantom	Ab_R1_020108-08	1784	FNN5101A	None	0.95	0.96	0.73

Left side to phantom	Ab_R1_020107-03	1747	FNN5101A	None	0.98	0.98	0.16
Right side to phantom	Ab_R1_020107-02	1747	FNN5101A	None	0.98	0.98	0.01
S.A.R. assessment PCS mode. Display/battery/scanner against the phantom							
Display towards phantom	Ab_R1_020110-02	1850	FNN5101A	None	1.03	1.03	0.34
Display towards phantom	Ab_R1_020110-03	1880	FNN5101A	None	1.02	1.02	0.31
Display towards phantom	Ab_R1_020110-04	1909	FNN5101A	None	0.97	0.97	0.41
Battery towards phantom	Ab_R1_020109-07	1850	FNN5101A	None	1.03	1.03	0.05
Battery towards phantom	Ab_R1_020109-06	1880	FNN5101A	None	1.02	1.01	0.04
Battery towards phantom	Ab_R1_020109-05	1909	FNN5101A	None	0.97	0.97	0.05
Scanner towards phantom	Ab_R1_020109-10	1850	FNN5101A	None	1.03	1.03	0.14
Scanner towards phantom	Ab_R1_020109-11	1880	FNN5101A	None	1.02	1.02	0.13
Scanner towards phantom	Ab_R1_020109-12	1909	FNN5101A	None	0.97	0.97	0.13
S.A.R. assessment PCS mode. Top/Left/Right against the phantom							
Top edge towards phantom	Ab_R1_020109-02	1850	FNN5101A	None	1.03	1.03	0.80
Top edge towards phantom	Ab_R1_020109-03	1880	FNN5101A	None	1.02	1.01	0.77
Top edge towards phantom	Ab_R1_020109-04	1909	FNN5101A	None	0.97	0.97	0.86
Left side to phantom	Ab_R1_020108-04	1850	FNN5101A	None	1.03	1.04	0.12
Left side to phantom	Ab_R1_020108-05	1880	FNN5101A	None	1.02	1.04	0.12
Left side to phantom	Ab_R1_020108-08	1909	FNN5101A	None	0.97	0.96	0.11
Right side to phantom	Ab_R1_020108-03	1850	FNN5101A	None	1.03	1.04	0.01
Right side to phantom	Ab_R1_020108-06	1880	FNN5101A	None	1.02	1.01	0.02
Right side to phantom	Ab_R1_020108-09	1909	FNN5101A	None	0.97	0.96	0.02
S.A.R. assessment in PCS mode with body worn accessory at worst case PCS configuration							
Scanner towards phantom	Ab_R1_020110-06	1850	FNN5101A	UPS192010	1.03	1.03	0.14
Display towards phantom	Ab_R1_020110-05	1909	FNN5101A	UPS192010	0.97	0.97	0.30

7.3 Peak S.A.R. location

Refer to APPENDIX B for detailed S.A.R. scan distributions.

8.0 Conclusion

The highest Operational Measured 1-gram average S.A.R. values found for the data terminal model number F4413A were **0.86 mW/g** at the abdomen:

These test results clearly demonstrate compliance with FCC General Population/Uncontrolled RF Exposure limits of **1.6 mW/g** per the requirements of 47 CFR 2.1093(d)

APPENDIX A

Power Slump Data

DIADIII with GPRS g18 Modem Power Measurements for EME

Initial Power Measurements E-GSM DIAD S/N 168SBS2829 g18 IMEI 000000081542284			E-GSM Power Slump @ 880.2 MHz (Ch. 975) S/N 168SBS2829		
Frequency (MHz)	Power (W)	Power (dBm)	Time (min)	Power (W)	Power (dBm)
880.2000	1.909	32.81	0	1.900	32.79
902.4000	1.894	32.77	1	1.915	32.82
914.8000	1.883	32.75	2	1.919	32.83
			3	1.926	32.85
			4	1.909	32.81
			5	1.917	32.83
			6	1.919	32.83
The power output was measured with: HP438A Power Meter, equipped with: HP8482H Power Sensor. Next calibration date: 08.11.2002			7	1.880	32.74
			8	1.921	32.84
			9	1.890	32.76
			10	1.953	32.91
			11	1.923	32.84
			12	1.931	32.86
			13	1.920	32.83
			14	1.940	32.88
Test Mode: TDMA			15	1.912	32.82
			16	1.908	32.81
			17	1.930	32.85
			18	1.914	32.82
			19	1.908	32.81
			20	1.917	32.83
			21	1.920	32.83
			22	1.902	32.79
			23	1.935	32.87
			24	1.921	32.84
			25	1.916	32.82
			26	1.922	32.84
			27	1.912	32.81
			28	1.917	32.83
			29	1.913	32.82
			30	1.901	32.79
			31	1.921	32.83
			32	1.914	32.82
			33	1.923	32.84
			34	1.918	32.83
			35	1.916	32.82
			36	1.913	32.82
			37	1.923	32.84
			38	1.914	32.82
			39	1.917	32.83
			40	1.916	32.82

DIADIII with GPRS g18 Modem Power Measurements for EME

E-GSM Power Slump @ 902.4 MHz (Ch. 62) S/N 168SBS2829			E-GSM Power Slump @ 914.8 MHz (Ch. 124) S/N 168SBS2829		
Time (min)	Power (W)	Power (dBm)	Time (min)	Power (W)	Power (dBm)
0	1.869	32.72	0	1.862	32.70
1	1.836	32.64	1	1.858	32.69
2	1.839	32.65	2	1.855	32.68
3	1.856	32.69	3	1.858	32.69
4	1.891	32.77	4	1.861	32.70
5	1.838	32.64	5	1.866	32.71
6	1.848	32.67	6	1.859	32.69
7	1.883	32.75	7	1.864	32.70
8	1.838	32.64	8	1.854	32.68
9	1.871	32.72	9	1.864	32.70
10	1.851	32.67	10	1.862	32.70
11	1.887	32.76	11	1.866	32.71
12	1.882	32.75	12	1.859	32.69
13	1.870	32.72	13	1.859	32.69
14	1.859	32.69	14	1.858	32.69
15	1.861	32.70	15	1.858	32.69
16	1.881	32.74	16	1.858	32.69
17	1.881	32.74	17	1.860	32.70
18	1.864	32.70	18	1.865	32.71
19	1.887	32.76	19	1.863	32.70
20	1.891	32.77	20	1.856	32.69
21	1.867	32.71	21	1.860	32.70
22	1.874	32.73	22	1.861	32.70
23	1.879	32.74	23	1.855	32.68
24	1.873	32.73	24	1.860	32.70
25	1.865	32.71	25	1.863	32.70
26	1.871	32.72	26	1.857	32.69
27	1.876	32.73	27	1.857	32.69
28	1.878	32.74	28	1.856	32.69
29	1.879	32.74	29	1.861	32.70
30	1.879	32.74	30	1.858	32.69
31	1.872	32.72	31	1.862	32.70
32	1.872	32.72	32	1.854	32.68
33	1.884	32.75	33	1.861	32.70
34	1.872	32.72	34	1.863	32.70
35	1.874	32.73	35	1.862	32.70
36	1.876	32.73	36	1.867	32.71
37	1.880	32.74	37	1.859	32.69
38	1.879	32.74	38	1.857	32.69
39	1.879	32.74	39	1.864	32.70
40	1.872	32.72	40	1.865	32.71

DIADIII with GPRS g18 Modem Power Measurements for EME

Initial Power Measurements DCS1800 DIAD S/N 168SBS2829 g18 IMEI 000000081542284			DCS1800 Power Slump @ 1710.2 MHz (Ch. 512) S/N 168SBS2829		
Frequency (MHz)	Power (W)	Power (W)	Time (min)	Power (W)	Power (dBm)
1710.2000	1.004	30.02	0	0.988	29.95
1747.4000	0.985	29.93	1	0.987	29.94
1784.8000	0.961	29.83	2	0.990	29.95
			3	0.987	29.94
			4	0.992	29.97
			5	0.995	29.98
			6	0.994	29.97
The power output was measured with: HP438A Power Meter, equipped with: HP8482H Power Sensor. Next calibration date: 08.11.2002			7	0.986	29.94
			8	0.983	29.93
			9	0.990	29.95
			10	0.991	29.96
			11	0.990	29.96
			12	0.985	29.93
			13	0.991	29.96
			14	0.990	29.96
Test Mode: TDMA			15	0.983	29.93
			16	0.998	29.99
			17	0.986	29.94
			18	0.991	29.96
			19	0.988	29.95
			20	0.992	29.96
			21	0.995	29.98
			22	0.986	29.94
			23	0.985	29.93
			24	0.986	29.94
			25	0.987	29.94
			26	0.993	29.97
			27	0.987	29.94
			28	0.984	29.93
			29	0.988	29.95
			30	0.991	29.96
			31	0.991	29.96
			32	0.989	29.95
			33	0.986	29.94
			34	0.987	29.94
			35	0.989	29.95
			36	0.989	29.95
			37	0.992	29.97
			38	0.992	29.96
			39	0.993	29.97
			40	0.990	29.96

DIADIII with GPRS g18 Modem Power Measurements for EME

DCS1800 Power Slump @ 1747.4 MHz (Ch. 698) S/N 168SBUxxxx			DCS1800 Power Slump @ 1784.8 MHz (Ch. 885) S/N 168SBS2829		
Time (min)	Power (W)	Power (dBm)	Time (min)	Power (W)	Power (dBm)
0	0.975	29.89	0	0.953	29.79
1	0.964	29.84	1	0.948	29.77
2	0.974	29.89	2	0.958	29.81
3	0.969	29.86	3	0.953	29.79
4	0.973	29.88	4	0.951	29.78
5	0.972	29.88	5	0.954	29.79
6	0.963	29.84	6	0.954	29.80
7	0.970	29.87	7	0.959	29.82
8	0.977	29.90	8	0.951	29.78
9	0.972	29.88	9	0.952	29.79
10	0.968	29.86	10	0.957	29.81
11	0.967	29.86	11	0.950	29.78
12	0.971	29.87	12	0.951	29.78
13	0.964	29.84	13	0.953	29.79
14	0.973	29.88	14	0.955	29.80
15	0.966	29.85	15	0.950	29.78
16	0.968	29.86	16	0.957	29.81
17	0.972	29.88	17	0.961	29.83
18	0.966	29.85	18	0.953	29.79
19	0.967	29.85	19	0.964	29.84
20	0.972	29.88	20	0.957	29.81
21	0.975	29.89	21	0.955	29.80
22	0.970	29.87	22	0.963	29.84
23	0.974	29.88	23	0.958	29.81
24	0.964	29.84	24	0.961	29.83
25	0.972	29.87	25	0.962	29.83
26	0.972	29.87	26	0.952	29.78
27	0.965	29.85	27	0.958	29.81
28	0.967	29.85	28	0.963	29.84
29	0.974	29.89	29	0.966	29.85
30	0.972	29.88	30	0.963	29.84
31	0.973	29.88	31	0.953	29.79
32	0.973	29.88	32	0.959	29.82
33	0.973	29.88	33	0.958	29.81
34	0.970	29.87	34	0.953	29.79
35	0.974	29.89	35	0.952	29.79
36	0.971	29.87	36	0.959	29.82
37	0.972	29.88	37	0.958	29.81
38	0.976	29.89	38	0.955	29.80
39	0.967	29.86	39	0.961	29.83
40	0.964	29.84	40	0.962	29.83

DIADIII with GPRS g18 Modem Power Measurements for EME

Initial Power Measurements PCS1900 DIAD S/N 168SBS2829 g18 IMEI 000000081542284			PCS1900 Power Slump @ 1850.2 MHz (Ch. 512) S/N 168SBS2829		
Frequency (MHz)	Power (W)	Power (dBm)	Time (min)	Power (W)	Power (dBm)
1850.2000	1.026	30.11	0	1.029	30.12
1880.0000	1.017	30.07	1	1.027	30.11
1909.8000	0.964	29.84	2	1.025	30.11
			3	1.025	30.11
			4	1.029	30.13
			5	1.025	30.11
			6	1.030	30.13
			7	1.028	30.12
			8	1.032	30.14
			9	1.025	30.11
			10	1.036	30.15
			11	1.034	30.14
			12	1.029	30.12
			13	1.022	30.09
			14	1.027	30.12
			15	1.028	30.12
			16	1.031	30.13
			17	1.029	30.13
			18	1.031	30.13
			19	1.029	30.12
			20	1.026	30.11
			21	1.036	30.15
			22	1.030	30.13
			23	1.036	30.15
			24	1.026	30.11
			25	1.030	30.13
			26	1.030	30.13
			27	1.033	30.14
			28	1.030	30.13
			29	1.026	30.11
			30	1.034	30.15
			31	1.035	30.15
			32	1.027	30.11
			33	1.029	30.12
			34	1.026	30.11
			35	1.034	30.15
			36	1.034	30.15
			37	1.027	30.12
			38	1.030	30.13
			39	1.032	30.14
			40	1.029	30.12

The power output was measured with:
HP438A Power Meter, equipped with:
HP8482H Power Sensor.
Next calibration date:
08.11.2002

Test Mode: TDMA

DIADIII with GPRS g18 Modem Power Measurements for EME

PCS1900 Power Slump @ 1880.0 MHz (Ch. 661) S/N 168SBS2829			PCS1900 Power Slump @ 1909.8 MHz (Ch. 810) S/N 168SBS2829		
Time (min)	Power (W)	Power (dBm)	Time (min)	Power (W)	Power (dBm)
0	1.024	30.10	0	0.967	29.85
1	1.024	30.10	1	0.965	29.85
2	1.023	30.10	2	0.968	29.86
3	1.022	30.10	3	0.961	29.83
4	1.021	30.09	4	0.961	29.83
5	1.017	30.07	5	0.965	29.85
6	1.025	30.11	6	0.965	29.84
7	1.020	30.09	7	0.964	29.84
8	1.025	30.11	8	0.967	29.85
9	1.019	30.08	9	0.965	29.84
10	1.023	30.10	10	0.964	29.84
11	1.022	30.10	11	0.964	29.84
12	1.013	30.06	12	0.964	29.84
13	1.013	30.06	13	0.965	29.84
14	1.011	30.05	14	0.964	29.84
15	1.014	30.06	15	0.970	29.87
16	1.013	30.06	16	0.964	29.84
17	1.014	30.06	17	0.969	29.86
18	1.019	30.08	18	0.966	29.85
19	1.014	30.06	19	0.968	29.86
20	1.016	30.07	20	0.968	29.86
21	1.011	30.05	21	0.959	29.82
22	1.018	30.08	22	0.957	29.81
23	1.017	30.07	23	0.968	29.86
24	1.015	30.06	24	0.965	29.85
25	1.020	30.09	25	0.968	29.86
26	1.014	30.06	26	0.959	29.82
27	1.013	30.06	27	0.961	29.83
28	1.015	30.07	28	0.963	29.84
29	1.015	30.07	29	0.967	29.85
30	1.014	30.06	30	0.964	29.84
31	1.014	30.06	31	0.964	29.84
32	1.017	30.07	32	0.962	29.83
33	1.019	30.08	33	0.965	29.84
34	1.009	30.04	34	0.961	29.83
35	1.016	30.07	35	0.968	29.86
36	1.014	30.06	36	0.969	29.86
37	1.011	30.05	37	0.968	29.86
38	1.028	30.12	38	0.960	29.82
39	1.024	30.10	39	0.964	29.84
40	1.024	30.10	40	0.967	29.85

APPENDIX B

Data Results

Data Terminal; Test Date: 01/04/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020104-05

Model #: F4413A

TX Freq: 914

Tissue Temp: 21.0 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

- Comments-

Front (Display) of DUT towards phantom

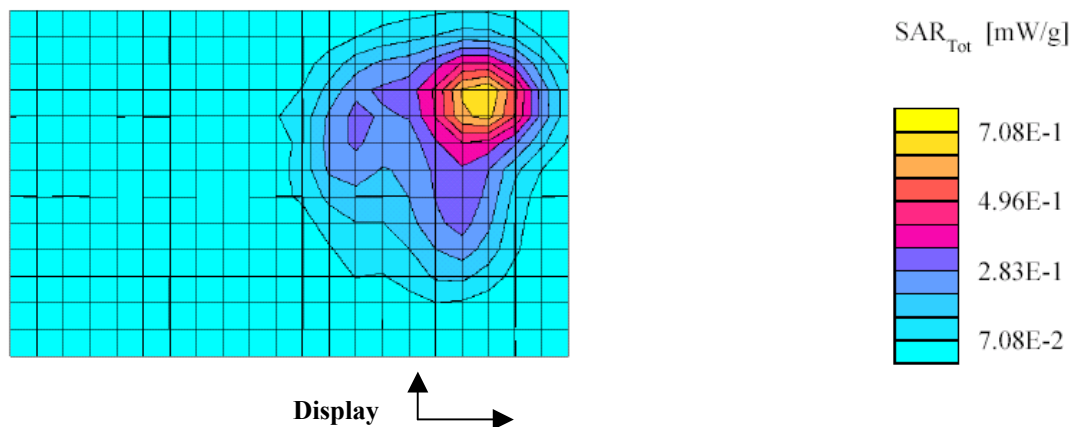
Flat Phantom; Device Section; Position: (90°,0°);

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(6.70,6.70,6.70); Probe cal date: 4/23/01; Crest factor: 8.0; FCC

Muscle_897 MHz: $\sigma = 1.05$ mho/m $\epsilon = 52.4$ $\rho = 1.00$ g/cm³; DAE3: 363-V1 DAE Calibration date: 8/22/01

Cube 5x5x7: SAR (1g): 0.746 mW/g, SAR (10g): 0.490 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 265.5, 144.0, 4.7



Data Terminal; Test Date: 01/04/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020104-05

Model #: F4413A

TX Freq: 914

Tissue Temp: 21.0 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

- Comments-

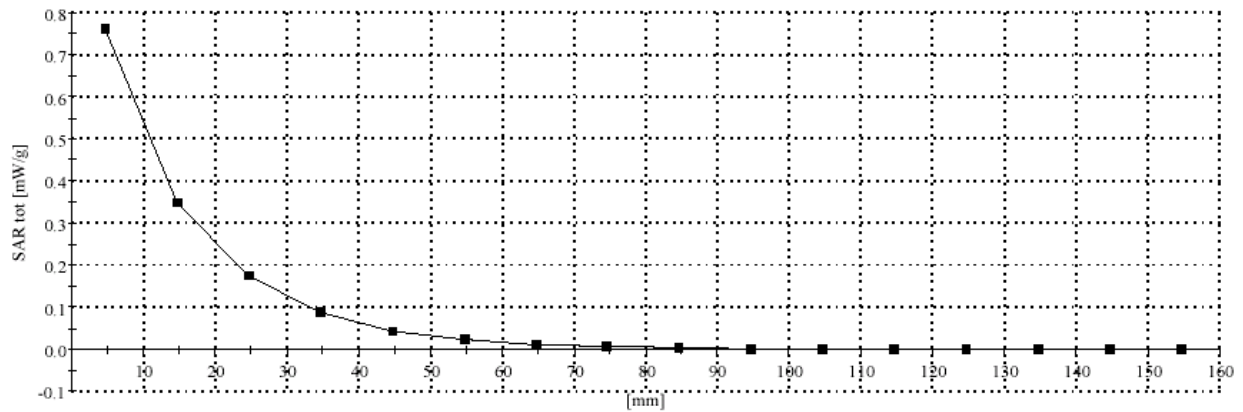
Front (Display) of DUT facing phantom

Flat Phantom; Section; Position: Frequency: 914 MHz

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(6.70,6.70,6.70); Crest factor: 8.0; FCC Muscle_897 MHz: $\sigma = 1.05$ mho/m

$\epsilon = 52.4$ $\rho = 1.00$ g/cm³; DAE3: 363-V1 DAE Calibration date: 8/22/01

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 10.0,



Data Terminal; Test Date: 01/04/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020104-03

Model #: F4413A

TX Freq: 902

Tissue Temp: 21.0 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

- Comments-

Top edge of DUT facing phantom

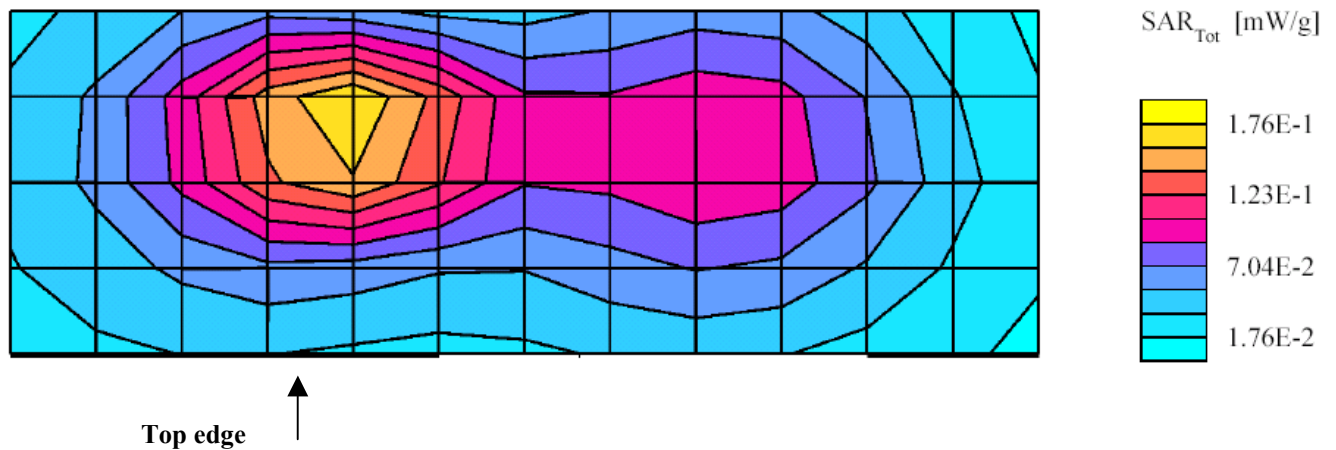
Flat Phantom; Device Section; Position: (90°,0°);

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(6.70,6.70,6.70); Probe cal date: 4/23/01; Crest factor: 8.0; FCC

Muscle_897 MHz: $\sigma = 1.05$ mho/m $\epsilon = 52.4$ $\rho = 1.00$ g/cm³; DAE3: 363-V1 DAE Calibration date: 8/22/01

Cube 5x5x7: SAR (1g): 0.199 mW/g, SAR (10g): 0.118 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 58.5, 40.5, 4.7



Data Terminal; Test Date: 01/04/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020104-03

Model #: F4413A

TX Freq: 902

Tissue Temp: 21.0 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

- Comments-

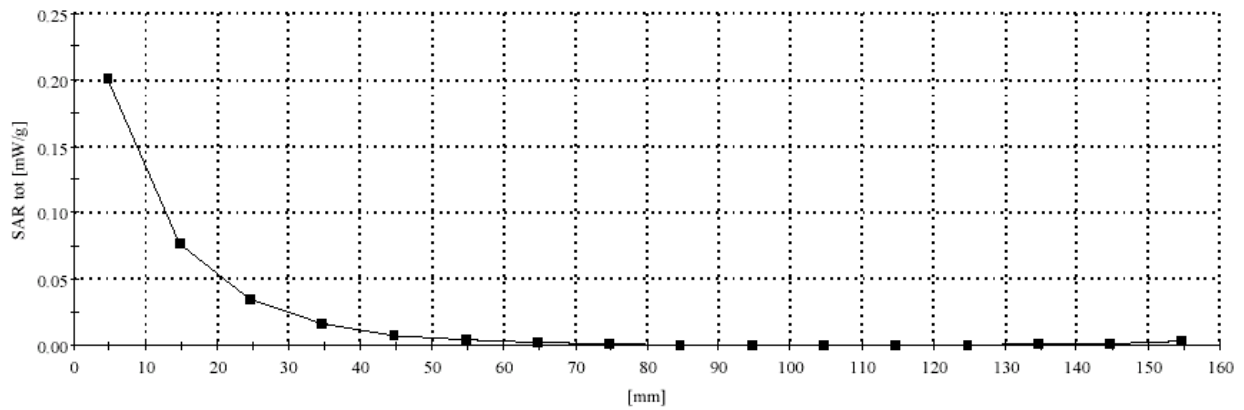
Top edge of DUT facing phantom

Flat Phantom; Section; Position: ; Frequency: 902 MHz

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(6.70,6.70,6.70); Crest factor: 8.0; FCC Muscle_897 MHz: $\sigma = 1.05$ mho/m

$\epsilon = 52.4$ $\rho = 1.00$ g/cm³; DAE3: 363-V1 DAE Calibration date: 8/22/01

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 10.0,



Data Terminal; Test Date: 01/04/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020104-08

Model #: F4413A

TX Freq: 1747

Tissue Temp: 21.3 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

- Comments-

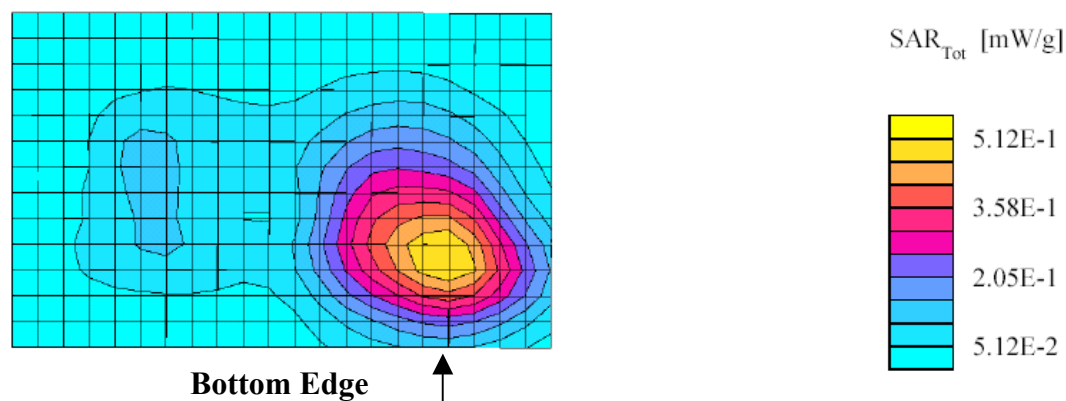
Bottom (battery) of DUT facing phantom

Flat Phantom; Device Section; Position: (90°,0°);

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(5.10,5.10,5.10); Probe cal date: 4/23/01; Crest factor: 8.0; FCC Body_1747MHz: $\sigma = 1.44$ mho/m $\epsilon = 52.1$ $\rho = 1.00$ g/cm³; DAE3: 363-V1 DAE Calibration date: 8/22/01

Cube 5x5x7: SAR (1g): 0.523 mW/g, SAR (10g): 0.406 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 253.5, 52.5, 4.7



Data Terminal; Test Date: 01/04/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020104-08

Model #: F4413A

TX Freq: 1747

Tissue Temp: 21.3 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

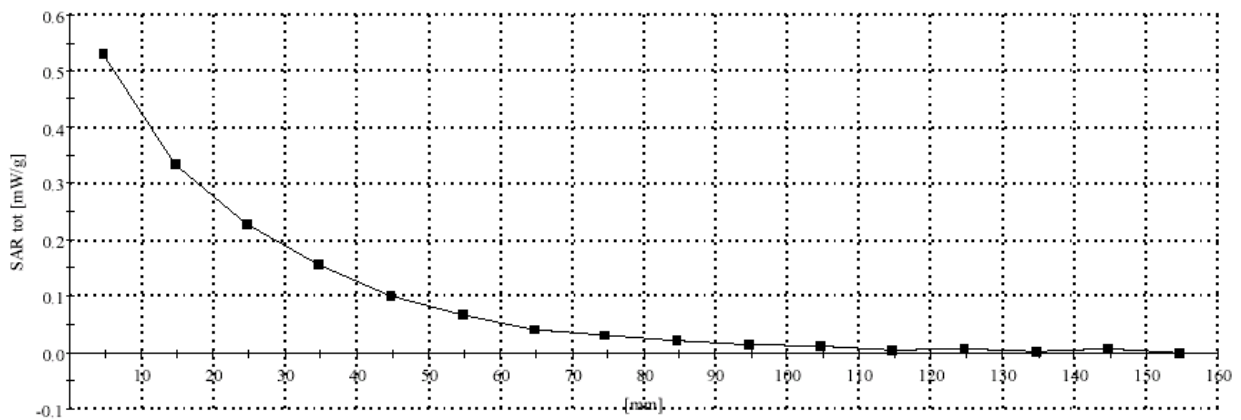
- Comments-

Bottom (battery) of DUT facing phantom

Flat Phantom; Section; Position: Frequency: 1747 MHz

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(5.10,5.10,5.10); Crest factor: 8.0; FCC Body_1747MHz: $\sigma = 1.44 \text{ mho/m}$ $\epsilon = 52.1$ $\rho = 1.00 \text{ g/cm}^3$; DAE3: 363-V1 DAE Calibration date: 8/22/01

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 10.0,



Data Terminal; Test Date:01/08/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020108-07

Model #: F4413A

Tissue Temp: 21.1 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

- Comments-

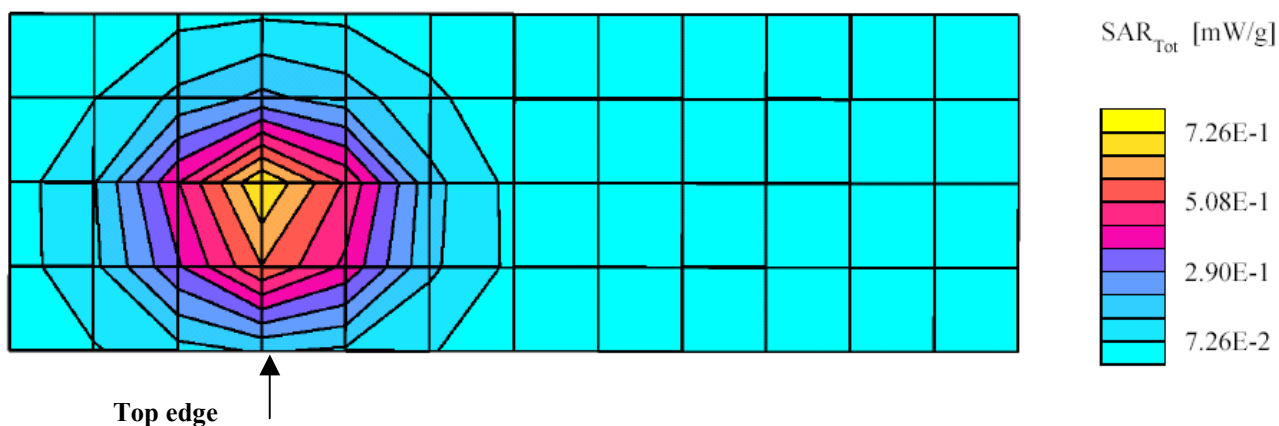
Top edge of DUT facing phantom

Flat Phantom; Device Section; Position: (90°,0°);

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(5.10,5.10,5.10); Probe cal date: 4/23/01; Crest factor: 8.0; FCC Body_1747MHz: $\sigma = 1.43$ mho/m $\epsilon = 51.7$ $\rho = 1.00$ g/cm³; DAE3: 363-V1 DAE Calibration date: 8/22/01

Cube 5x5x7: SAR (1g): 0.774 mW/g, SAR (10g): 0.434 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 46.5, 25.5, 4.7



Data Terminal; Test Date: 01/08/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020108-07

Model #: F4413A

TX Freq: 1710

Tissue Temp: 21.1 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

- Comments-

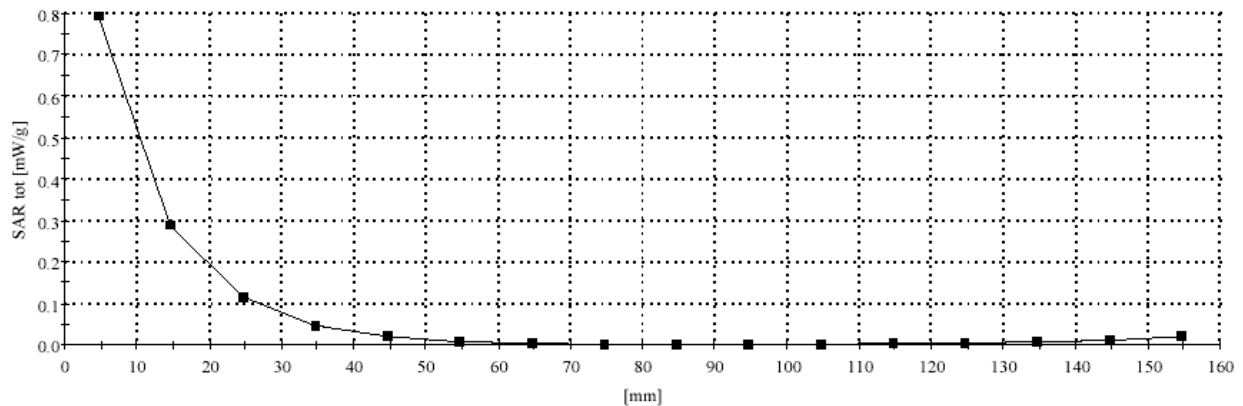
Top edge of DUT facing phantom

Flat Phantom; Section; Position; Frequency: 1710 MHz

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF (5.10,5.10,5.10); Crest factor: 8.0; FCC Body_1747MHz: $\sigma = 1.43 \text{ mho/m}$

$\epsilon = 51.7$ $\rho = 1.00 \text{ g/cm}^3$; DAE3: 363-V1 DAE Calibration date: 8/22/01

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 10.0,



Data Terminal; Test Date: 01/10/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020110-04

Model #: F4413A

TX Freq: 1909

Tissue Temp: 20.5 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

- Comments-

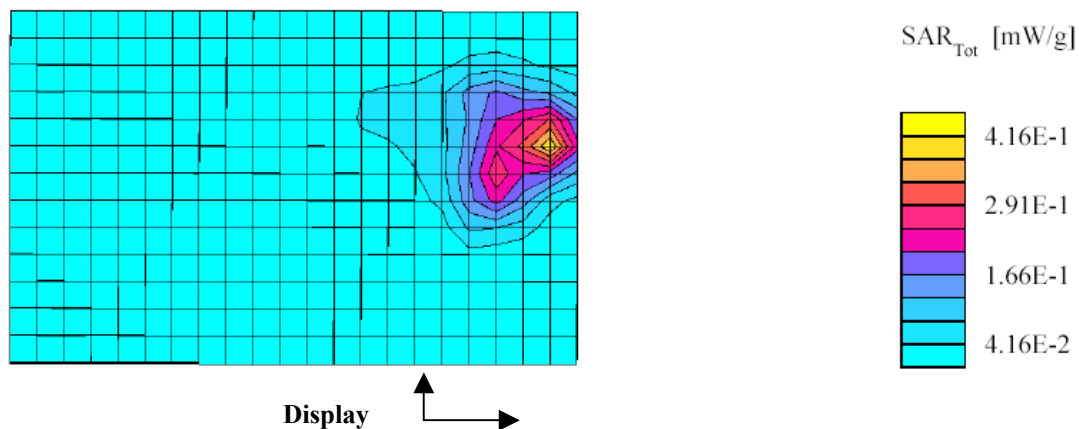
Front (display) of DUT facing phantom

Flat Phantom; Device Section; Position: (90°,0°);

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(4.90,4.90,4.90); Probe cal date: 4/23/01; Crest factor: 8.0; FCC Body_1880MHz: $\sigma = 1.58$ mho/m $\epsilon = 50.8$ $\rho = 1.00$ g/cm³

Cube 5x5x7: SAR (1g): 0.412 mW/g, SAR (10g): 0.230 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 301.5, 121.5, 4.7



Data Terminal; Test Date: 01/10/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020110-04

Model #: F4413A

TX Freq: 1909

Tissue Temp: 20.5 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

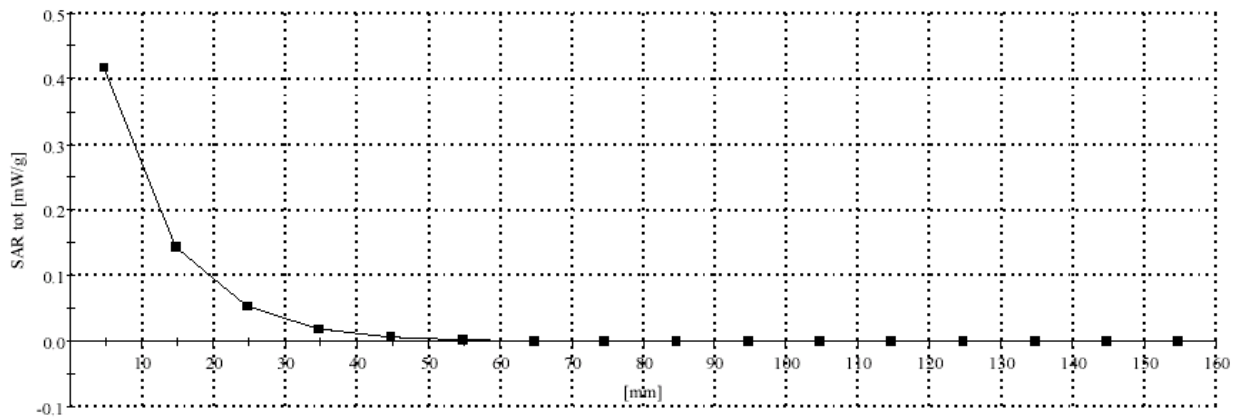
- Comments-

Front (display) of DUT facing phantom

Flat Phantom; Section; Position: Frequency: 1909 MHz

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(4.90,4.90,4.90); Crest factor: 8.0; FCC Body_1880MHz: $\sigma = 1.58 \text{ mho/m}$ $\epsilon = 50.8$ $\rho = 1.00 \text{ g/cm}^3$; DAE3: 363-V1 DAE Calibration date: 8/22/01

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 10.0,



Data Terminal; Test Date: 01/09/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020109-04

Model #: F4413A

TX Freq: 1909

Tissue Temp: 20.3 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

- Comments-

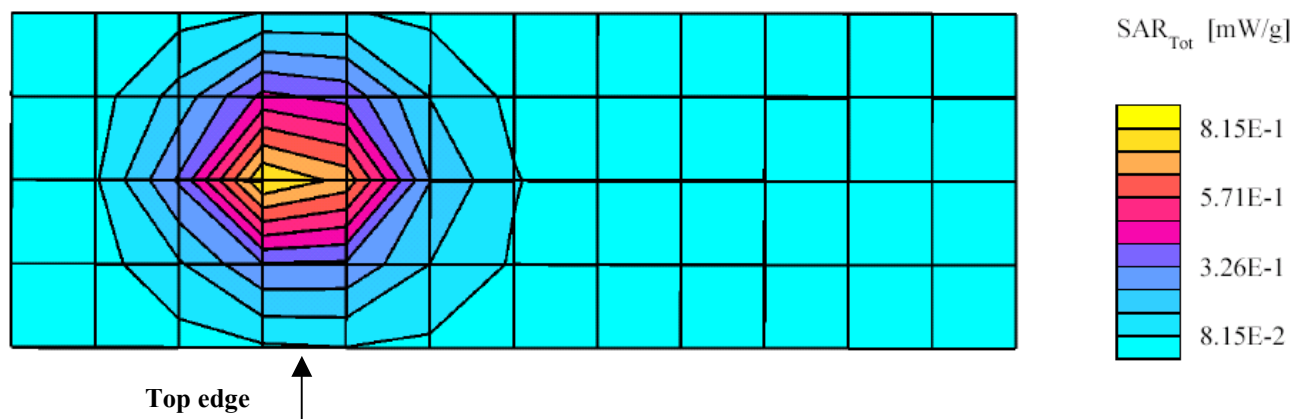
Top edge of DUT facing phantom

Flat Phantom; Device Section; Position: (90°,0°);

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(4.90,4.90,4.90); Probe cal date: 4/23/01; Crest factor: 8.0; FCC Body_1880MHz: $\sigma = 1.59$ mho/m $\epsilon = 51.1$ $\rho = 1.00$ g/cm³; DAE3: 363-V1 DAE Calibration date: 8/22/01

Cube 5x5x7: SAR (1g): 0.859 mW/g, SAR (10g): 0.458 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 49.5, 30.0, 4.7



Data Terminal; Test Date: 01/09/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020109-04

Model #: F4413A

TX Freq: 1909

Tissue Temp: 20.3 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

None

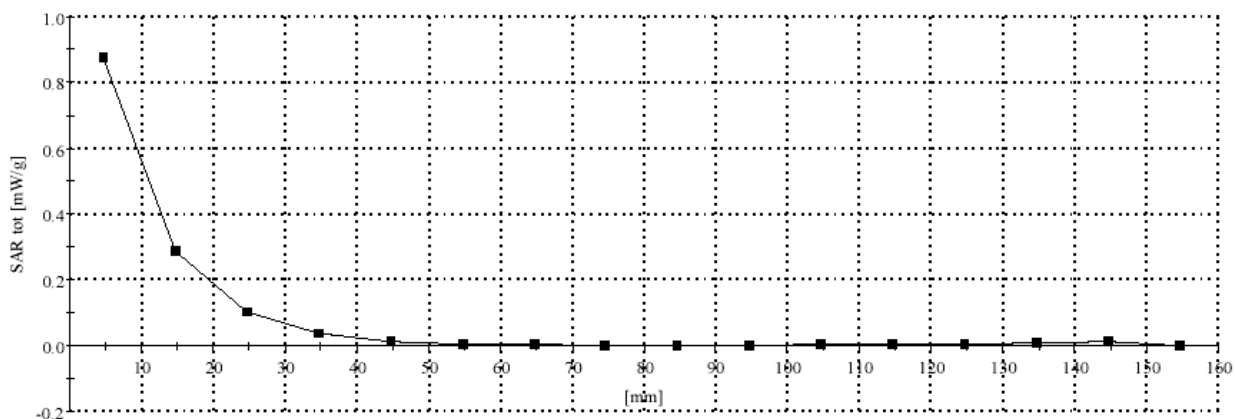
- Comments-

Top edge of DUT facing phantom

Flat Phantom; Section; Position; Frequency: 1909 MHz

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(4.90,4.90,4.90); Crest factor: 8.0; FCC Body_1880MHz: $\sigma = 1.59$ mho/m $\epsilon = 51.1$ $\rho = 1.00$ g/cm³; DAE3: 363-V1 DAE Calibration date: 8/22/01

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 10.0,



Data Terminal; Test Date: 01/10/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020110-05

Model #: F4413A

TX Freq: 1909

Tissue Temp: 20.5 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

UPS192010

- Comments-

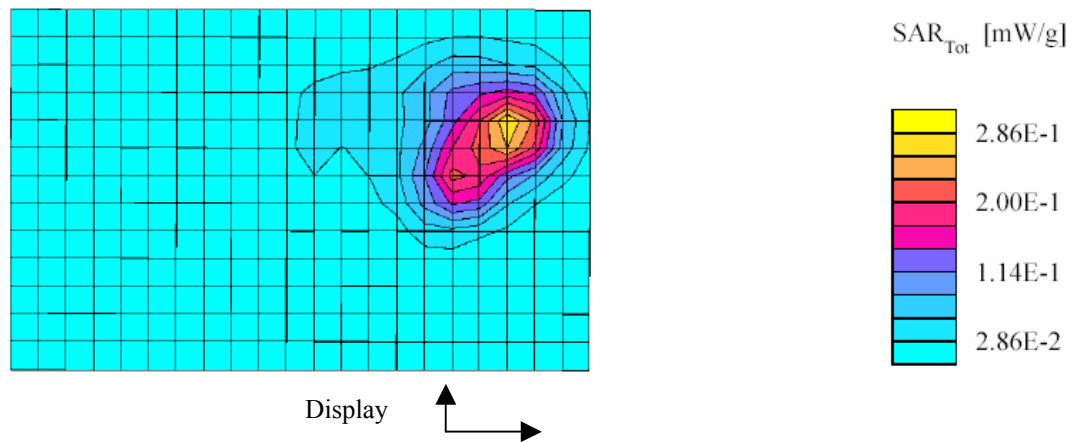
Front (display) of DUT facing phantom

Flat Phantom; Device Section; Position: (90°,0°);

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(4.90,4.90,4.90); Probe cal date: 4/23/01; Crest factor: 8.0; FCC Body_1880MHz: $\sigma = 1.58$ mho/m $\epsilon = 50.8$ $\rho = 1.00$ g/cm³

Cube 5x5x7: SAR (1g): 0.302 mW/g, SAR (10g): 0.175 mW/g, (Worst-case extrapolation)

Coarse: Dx = 15.0, Dy = 15.0, Dz = 10.0; Max at 271.5, 130.5, 4.7



Data Terminal; Test Date: 01/10/02

Motorola CGISS EME Laboratory

Run #: Ab_R1_020110-05

Model #: F4413A

TX Freq: 1909

Tissue Temp: 20.5 (Celsius)

Antenna: Internal Battery Kit: FNN5101A

- Accessories -

UPS192010

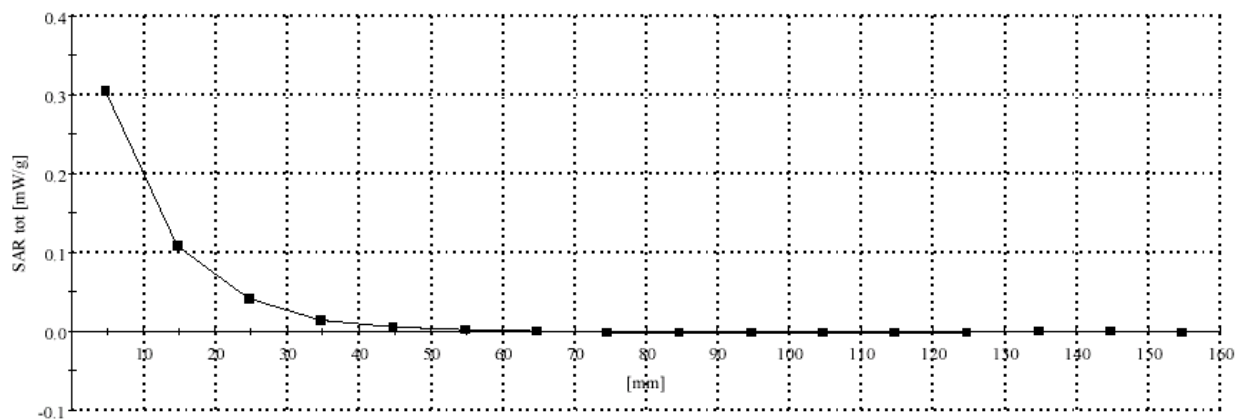
- Comments-

Front (display) of DUT facing phantom

Flat Phantom; Section; Position; Frequency: 1909 MHz

Probe: ET3DV6 - SN1393 SPEAG Original; ConvF(4.90,4.90,4.90); Crest factor: 8.0; FCC Body_1880MHz: $\sigma = 1.58 \text{ mho/m}$ $\epsilon = 50.8$ $\rho = 1.00 \text{ g/cm}^3$; DAE3: 363-V1 DAE Calibration date: 8/22/01

Z-Axis: Dx = 0.0, Dy = 0.0, Dz = 10.0,



APPENDIX C
Dipole System Performance Check Results

Dipole D900 V2 SN- 085; Test Date:01/03/02

Motorola CGISS EME Lab

Run #; Sys Val_R1_020103-01

TX Freq; 900 MHz

Tissue Temp; 21.5 (Celsius)

Start Power; 250 mW

IEEE std 1528 (Draft) target at 1W is 10.8 (1g)

IEEE std 1528 (Draft) target at 1W is 6.9 (10g)

SAR calculated is 11.82; Percent from target (including drift) for 1g is 9.52%

SAR calculated is 7.43; Percent from target (including drift) for 10g is 7.65%

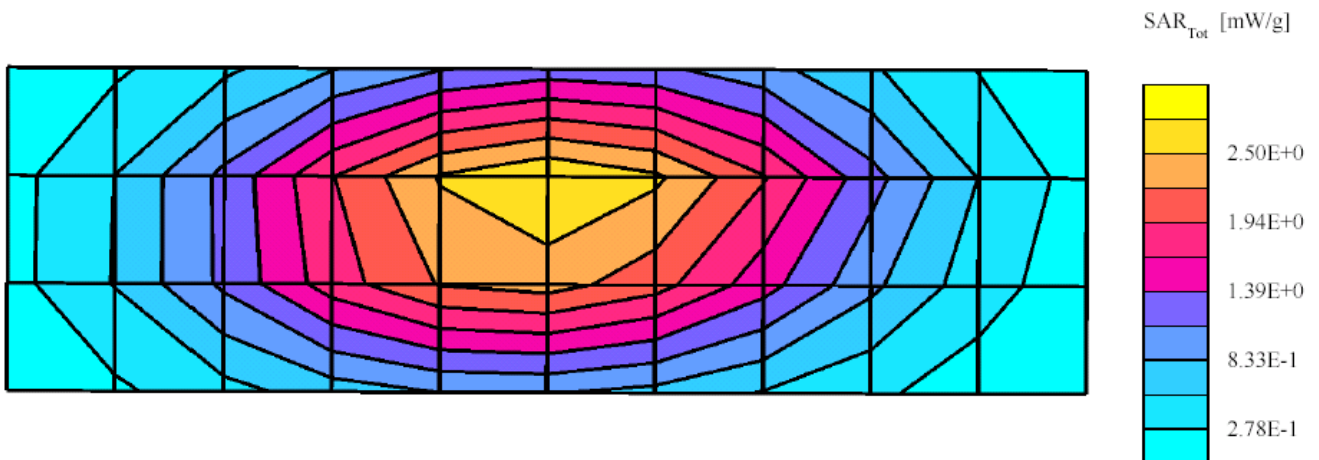
Flat Phantom; Dipole

Probe: ET3DV6 - SN1393 SPEAG Original; Probe Cal Date: 4/23/01ConvF(6.89,6.89,6.89); Crest factor: 1.0; IEEE Head_900 MHz: $\sigma = 1.00\text{mho/m}$ $\epsilon = 41.8$ $\rho = 1.00\text{ g/cm}^3$; DAE3: 363-V1 DAE Calibration date: 8/22/01

Cube 5x5x7: Peak: 4.65 mW/g, SAR (1g): 2.93 mW/g, SAR (10g): 1.84 mW/g, (Worst-case extrapolation)

Penetration depth: 11.5 (10.7, 12.6) [mm]

Power drift: -0.04 dB



SPEAG Dipole D900 V2 SN - 085 Test Date: 01/04/02

Motorola CGISS EME Lab

Run #; Sys Val_R1_020104-01

TX Freq; 900 MHz

Tissue Temp; 20.7 (Celsius)

Start Power; 250 mW

IEEE std 1528 (Draft) target at 1W is 10.8 (1g)

IEEE std 1528 (Draft) target at 1W is 6.9 (10g)

SAR calculated is 11.65mW/g, Percent from target (including drift) for 1g is 7.9%

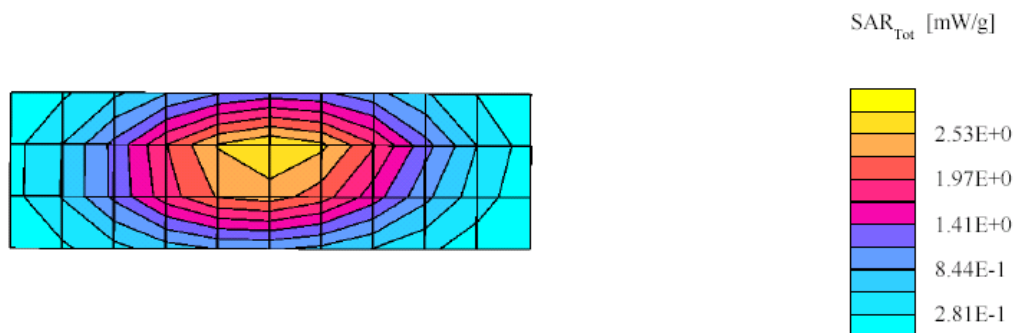
SAR calculated is 7.31mW/g, Percent from target (including drift) for 10g is 5.99%

Flat Phantom; DipoleProbe: ET3DV6 - SN1393 SPEAG Original;Probe Cal Date: 4/23/01ConvF(6.89,6.89,6.89); Crest factor: 1.0; IEEE Head_900 MHz: $\sigma = 0.98$ mho/m $\epsilon = 40.9$ $\rho = 1.00$ g/cm³

Cube 5x5x7: Peak: 4.62 mW/g, SAR (1g): 2.90 mW/g, SAR (10g): 1.82 mW/g, (Worst-case extrapolation)

Penetration depth: 11.4 (10.6, 12.4) [mm]

Power drift: -0.02 dB

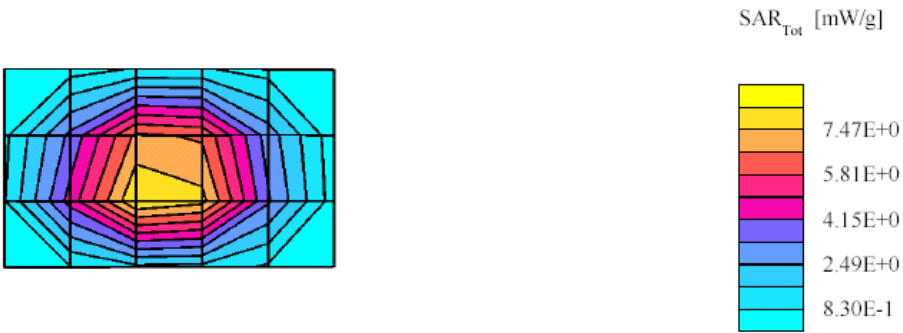


SPEAG Dipole D1800 V2 SN – 278; Test Date:01/04/02
Motorola CGISS EME Lab

Run #; Sys Val_R1_020104-07
TX Freq; 1800 MHz
Tissue Temp; 21.6 (Celsius)
Start Power; 250 mW

IEEE std 1528 (Draft) target at 1W is 38.1 (1g)
IEEE std 1528 (Draft) target at 1W is 19.8 (10g)
SAR calculated is 40.8mW/g, Percent from target (including drift) for 1g is 7.08%
SAR calculated is 21.52mW/g, Percent from target (including drift) for 10g is 8.69%

Flat Phantom; Dipole Probe: ET3DV6 - SN1393 SPEAG Original; Probe Cal Date: 4/23/01ConvF(5.55,5.55,5.55); Crest factor: 1.0; IEEE Head_1800MHz: $\sigma = 1.38 \text{ mho/m}$ $\epsilon = 38.5$ $\rho = 1.00 \text{ g/cm}^3$
Cube 5x5x7: Peak: 18.5 mW/g, SAR (1g): 10.2 mW/g, SAR (10g): 5.38 mW/g, (Worst-case extrapolation)
Penetration depth: 8.4 (8.1, 9.2) [mm]
Power drift: -0.00 dB



SPEAG Dipole D1800 V2 SN – 278; Test Date:01/07/02

Motorola CGISS EME Lab

Run #; Sys Val_R1_020107-01

Model #; D1800 V2 SN; 278

TX Freq; 1800 MHz

Tissue Temp; 21.4 (Celsius)

Start Power; 250 mW

IEEE std 1528 (Draft) target at 1W is 38.1 (1g)

IEEE std 1528 (Draft) target at 1W is 19.8 (10g)

SAR calculated is 40.77mW/g, Percent from target (including drift) for 1g is 7.02%

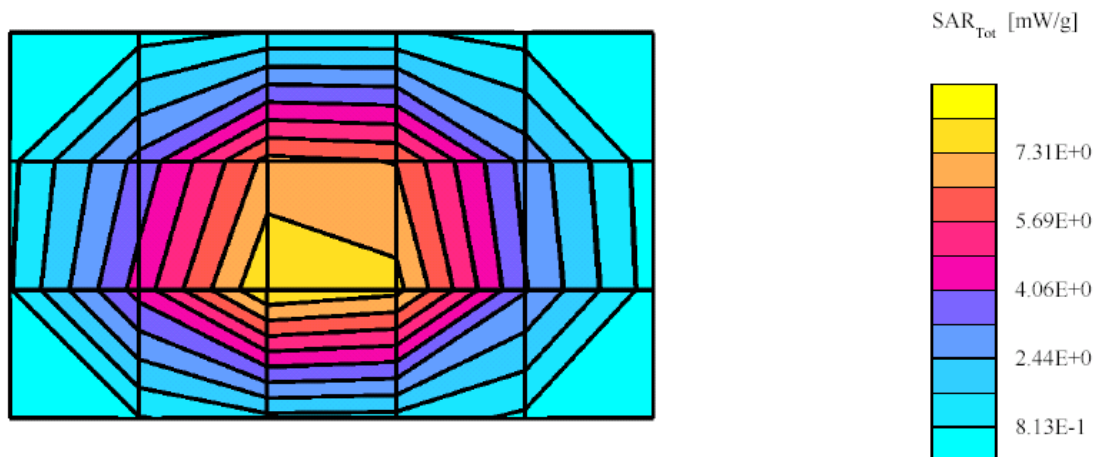
SAR calculated is 21.43mW/g, Percent from target (including drift) for 10g is 8.26%

Flat Phantom; Dipole Probe: ET3DV6 - SN1393 SPEAG Original; Probe Cal Date: 4/23/01ConvF(5.55,5.55,5.55); Crest factor: 1.0; IEEE Head_1800MHz: $\sigma = 1.38$ mho/m $\epsilon = 38.3$ $\rho = 1.00$ g/cm³

Cube 5x5x7: Peak: 18.5 mW/g, SAR (1g): 10.1 mW/g, SAR (10g): 5.31 mW/g, (Worst-case extrapolation)

Penetration depth: 8.3 (8.0, 9.1) [mm]

Power drift: -0.04 dB



SPEAG Dipole D1800 V2 SN - 278; Test Date: 01/08/02

Motorola CGISS EME Lab

Run #; Sys Val_R1_020108-01

TX Freq; 1800 MHz

Tissue Temp; 20.7 (Celsius)

Start Power; 250 mW

IEEE std 1528 (Draft) target at 1W is 38.1 (1g)

IEEE std 1528 (Draft) target at 1W is 19.8 (10g)

SAR calculated is 40.04mW/g, Percent from target (including drift) for 1g is 5.08%

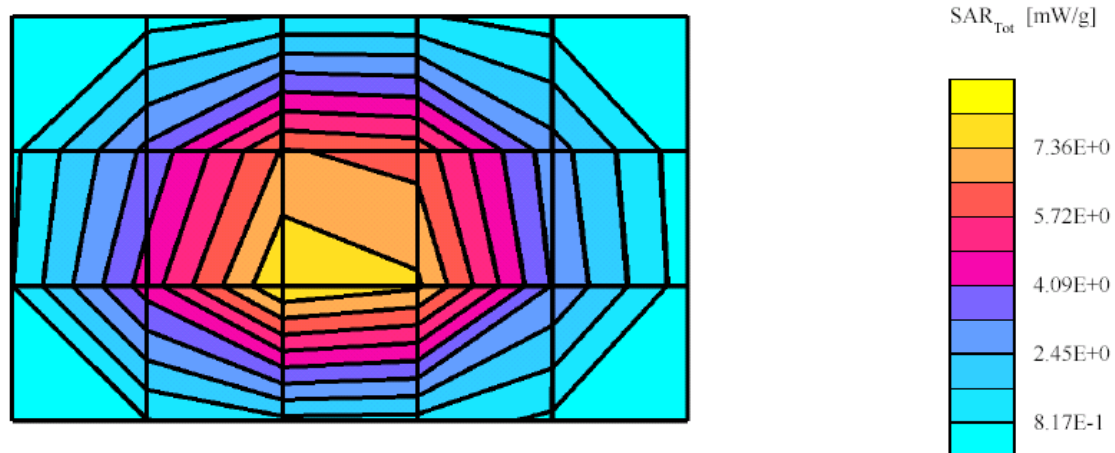
SAR calculated is 21.06mW/g, Percent from target (including drift) for 10g is 6.39%

Flat Phantom; Dipole Probe: ET3DV6 - SN1393 SPEAG Original; Probe Cal Date: 4/23/01 ConvF(5.55,5.55,5.55); Crest factor: 1.0; IEEE Head_1800MHz: $\sigma = 1.37$ mho/m $\epsilon = 38.3$ $\rho = 1.00$ g/cm³

Cube 5x5x7: Peak: 18.3 mW/g, SAR (1g): 9.94 mW/g, SAR (10g): 5.23 mW/g, (Worst-case extrapolation)

Penetration depth: 8.3 (8.0, 9.1) [mm]

Power drift: -0.03 dB



SPEAG Dipole D1800 V2 SN - 278; Test Date:01/09/02

Motorola CGISS EME Lab

Run #; Sys Val_R1_020109-01

TX Freq; 1800 MHz

Tissue Temp; 20.3 (Celsius)

Start Power; 250 mW

IEEE std 1528 (Draft) target at 1W is 38.1 (1g)

IEEE std 1528 (Draft) target at 1W is 19.8 (10g)

SAR calculated is 40.68mW/g, Percent from target (including drift) for 1g is 6.77%

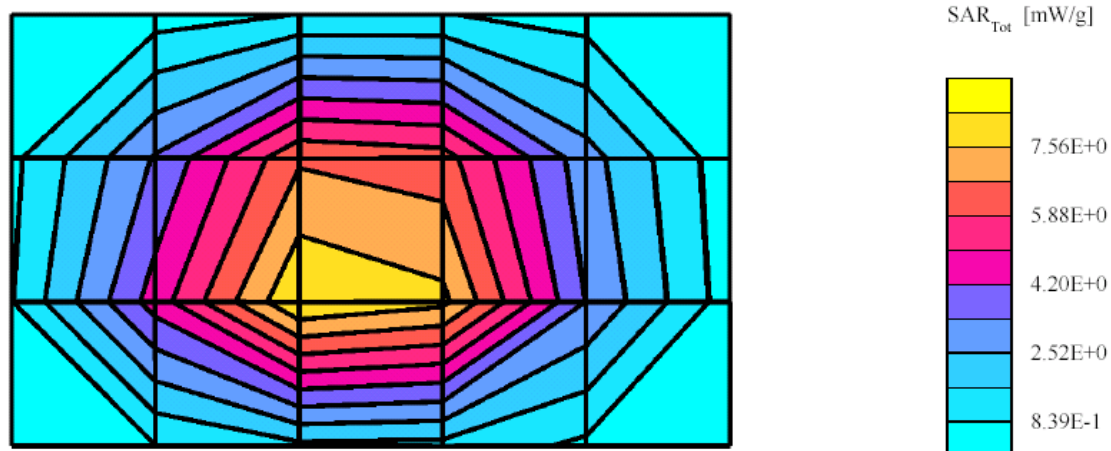
SAR calculated is 21.55mW/g, Percent from target (including drift) for 10g is 8.83%

Flat Phantom; Dipole Probe: ET3DV6 - SN1393 SPEAG Original; Probe Cal Date: 4/23/01ConvF(5.55,5.55,5.55); Crest factor: 1.0; IEEE Head_1800MHz: $\sigma = 1.38$ mho/m $\epsilon = 38.1$ $\rho = 1.00$ g/cm³

Cube 5x5x7: Peak: 18.4 mW/g, SAR (1g): 10.1 mW/g, SAR (10g): 5.35 mW/g, (Worst-case extrapolation)

Penetration depth: 8.4 (8.1, 9.1) [mm]

Power drift: -0.03 dB



SPEAG Dipole D1800 V2 SN - 278; Test Date:01/10/02

Motorola CGISS EME Lab

Run #; Sys Val_R1_020110-01

TX Freq; 1800 MHz

Tissue Temp; 20.8 (Celsius)

Start Power; 250 mW

IEEE std 1528 (Draft) target at 1W is 38.1 (1g)

IEEE std 1528 (Draft) target at 1W is 19.8 (10g)

SAR calculated is 40.58mW/g, Percent from target (including drift) for 1g is 6.52%

SAR calculated is 21.46mW/g, Percent from target (including drift) for 10g is 8.38%

Flat Phantom; Dipole Probe: ET3DV6 - SN1393 SPEAG Original; Probe Cal Date: 4/23/01ConvF(5.55,5.55,5.55); Crest factor: 1.0; IEEE Head_1800MHz: $\sigma = 1.37$ mho/m $\epsilon = 38.1$ $\rho = 1.00$ g/cm³

Cube 5x5x7: Peak: 18.4 mW/g, SAR (1g): 10.1 mW/g, SAR (10g): 5.34 mW/g, (Worst-case extrapolation)

Penetration depth: 8.4 (8.1, 9.1) [mm]

Power drift: -0.02 dB

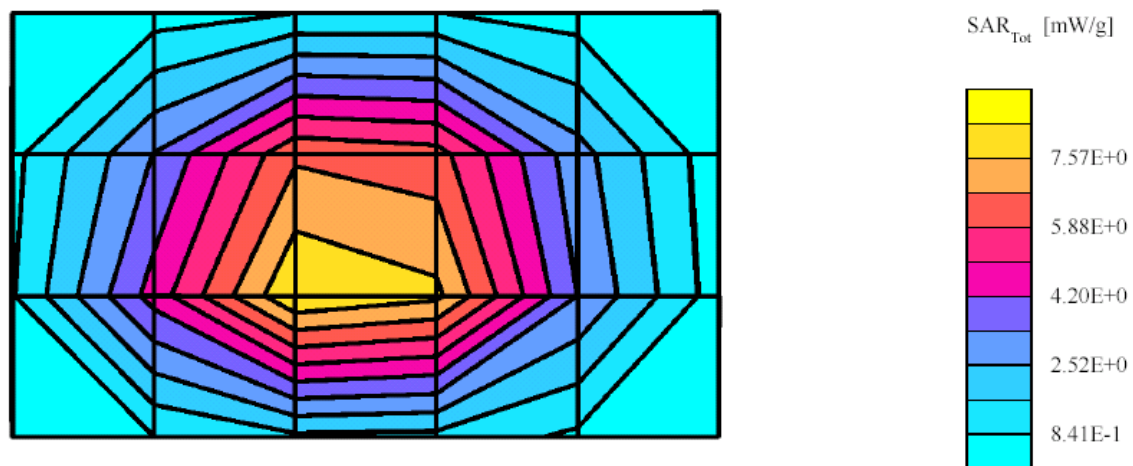


Table 7.1 – Numerical reference SAR values for reference dipole and flat phantom. All values are normalized to a forward power of 1 W.

Frequency (MHz)	1 g SAR	10 g SAR	local SAR at surface (above feedpoint)	local SAR at surface (y=2cm offset from feedpoint)
300	3.0	2.0	4.4	2.1
450	4.9	3.3	7.2	3.2
835	9.5	6.2	14.1	4.9
900	10.8	6.9	16.4	5.4
1450	29.0	16.0	50.2	6.5
1800	38.1	19.8	69.5	6.8
1900	39.7	20.5	72.1	6.6
2000	41.1	21.1	74.6	6.5
2450	52.4	24.0	104.2	7.7
3000	63.8	25.7	140.2	9.5

APPENDIX D
Calibration Certificates

Calibration Certificate

Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1393

Place of Calibration:

Zurich

Date of Calibration:

April 23, 2001

Calibration Interval:

12 months

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:

Nicolaus Neumann

Approved by:

Volker Kuhn

Probe ET3DV6

SN:1393

Manufactured:	October 1, 1999
Last calibration:	February 4, 2000
Repaired:	April 6, 2001
Recalibrated:	April 23, 2001

Calibrated for System DASY3

ET3DV6 SN:1393

DASY3 - Parameters of Probe: ET3DV6 SN:1393

Sensitivity in Free Space

NormX	1.78 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.45 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.75 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression

DCP X	96 mV
DCP Y	100 mV
DCP Z	96 mV

Sensitivity in Tissue Simulating Liquid

Head 450 MHz $\epsilon_r = 43.5 \pm 5\%$ $\sigma = 0.87 \pm 10\%$ mho/m

ConvF X	7.55 extrapolated	Boundary effect:
ConvF Y	7.55 extrapolated	Alpha 0.17
ConvF Z	7.55 extrapolated	Depth 3.24

Head 900 MHz $\epsilon_r = 42 \pm 5\%$ $\sigma = 0.97 \pm 10\%$ mho/m

ConvF X	6.89 $\pm 7\%$ (k=2)	Boundary effect:
ConvF Y	6.89 $\pm 7\%$ (k=2)	Alpha 0.23
ConvF Z	6.89 $\pm 7\%$ (k=2)	Depth 2.94

Head 1500 MHz $\epsilon_r = 40.4 \pm 5\%$ $\sigma = 1.23 \pm 10\%$ mho/m

ConvF X	6.00 interpolated	Boundary effect:
ConvF Y	6.00 interpolated	Alpha 0.32
ConvF Z	6.00 interpolated	Depth 2.55

Head 1800 MHz $\epsilon_r = 40 \pm 5\%$ $\sigma = 1.40 \pm 10\%$ mho/m

ConvF X	5.55 $\pm 7\%$ (k=2)	Boundary effect:
ConvF Y	5.55 $\pm 7\%$ (k=2)	Alpha 0.37
ConvF Z	5.55 $\pm 7\%$ (k=2)	Depth 2.36

Sensor Offset

Probe Tip to Sensor Center	2.7	mm
Optical Surface Detection	2.0 $\pm$ 0.2	mm



Schmid & Partner Engineering AG

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Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1393

Place of Assessment:

Zurich

Date of Assessment:

August 22, 2001

Probe Calibration Date:

April 23, 2001

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:

Dosimetric E-Field Probe ET3DV6 SN:1393

Conversion factor ($\pm$ standard deviation)

835 MHz	ConvF	$7.0 \pm 8\%$	$\epsilon_r = 41.5$ $\sigma = 0.90 \text{ mho/m}$ (head tissue)
835 MHz	ConvF	$6.8 \pm 8\%$	$\epsilon_r = 55.2$ $\sigma = 0.97 \text{ mho/m}$ (body tissue)
900 MHz	ConvF	$6.7 \pm 8\%$	$\epsilon_r = 55.0$ $\sigma = 1.05 \text{ mho/m}$ (body tissue)
1800 MHz	ConvF	$5.1 \pm 8\%$	$\epsilon_r = 53.3$ $\sigma = 1.52 \text{ mho/m}$ (body tissue)
1950 MHz	ConvF	$4.9 \pm 8\%$	$\epsilon_r = 53.3$ $\sigma = 1.52 \text{ mho/m}$ (body tissue)
2450 MHz	ConvF	$4.2 \pm 10\%$	$\epsilon_r = 52.7$ $\sigma = 1.95 \text{ mho/m}$ (body tissue)

Schmid & Partner Engineering AG

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Calibration Certificate

900 MHz System Validation Dipole

Type:

D900V2

Serial Number:

085

Place of Calibration:

Zurich

Date of Calibration:

Nov. 1, 2000

Calibration Interval:

24 months

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:

Nicolae Meriana

Approved by:

Oliver Kofler

1. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with brain simulating sugar solution of the following electrical parameters at 900 MHz:

Relative Dielectricity	40.0	$\pm 5\%$
Conductivity	0.85 mho/m	$\pm 5\%$

and at 925 MHz:

Relative Dielectricity	39.6	$\pm 5\%$
Conductivity	0.87 mho/m	$\pm 5\%$

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.42 at 900 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.

The dipole input power (forward power) was 250mW $\pm 3\%$. The results are normalized to 1W input power.

2. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 1. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values at 900 MHz are:

averaged over 1 cm ³ (1 g) of tissue:	10.32 mW/g
averaged over 10 cm ³ (10 g) of tissue:	6.6 mW/g

and at 925 MHz

averaged over 1 cm ³ (1 g) of tissue:	10.4 mW/g
averaged over 10 cm ³ (10 g) of tissue:	6.6 mW/g

Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well. The estimated sensitivities of SAR-values and penetration depths to the liquid parameters are listed in the DASY Application Note 4: 'SAR Sensitivities'.

3. Dipole Impedance and return loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	1.408 ns	(one direction)
Transmission factor:	0.988	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 900 MHz:	$\text{Re}\{Z\} = \mathbf{55.3\ \Omega}$
---------------------------------	--

$\text{Im}\{Z\} = \mathbf{0.5\ \Omega}$

Return Loss at 900 MHz	-26.1 dB
------------------------	-----------------

Feedpoint impedance at 925 MHz:	$\text{Re}\{Z\} = \mathbf{57.9\ \Omega}$
---------------------------------	--

$\text{Im}\{Z\} = \mathbf{13.1\ \Omega}$
--

Return Loss at 925 MHz	-17.0 dB
------------------------	-----------------

4. Handling

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.

Do not apply excessive force to the dipole arms, because they might bend. If the dipole arms have to be bent back, take care to release stress to the soldered connections near the feedpoint; they might come off.

After prolonged use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Validation Dipole D900V2 SN:085, d = 15 mm

Frequency: 925 MHz; Antenna Input Power: 250 [mW]
Generic: Twin Phantom; Flat Section; Grid Spacing: Dx = 15.0, Dy = 15.0, Dz = 10.0
Probe: ET3DVG - SN1507; Conv(6.42,6.42,6.42) at 900 MHz; Brain 925 MHz, $\sigma = 0.87$ mho/m $\epsilon_r = 39.6$ $\rho = 1.00$ g/cm³
Cubes (2): Peak: 4.14 mW/g ± 0.01 dB, SAR (1g): 2.60 mW/g ± 0.01 dB, SAR (10g): 1.65 mW/g ± 0.01 dB, (Worst-case extrapolation)
Penetration depth: 11.9 (10.7, 13.5) [mm]
Power/fit: 0.01 dB



Schmid & Partner Engineering AG

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Calibration Certificate

1800 MHz System Validation Dipole

Type:

D1800V2

Serial Number:

278

Place of Calibration:

Zurich

Date of Calibration:

Jan. 4, 2001

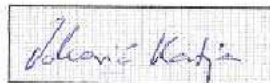
Calibration Interval:

24 months

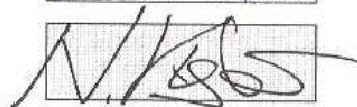
Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:



Approved by:



1. Measurement Conditions

The measurements were performed in the flat section of the new generic twin phantom filled with brain simulating sugar solution of the following electrical parameters at 1800 MHz:

Relative Dielectricity	40.0	$\pm 5\%$
Conductivity	1.71 mho/m	$\pm 5\%$

The DASY3 System (Software version 3.1c) with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.67 at 1800 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.

The dipole input power (forward power) was 250mW $\pm 3\%$. The results are normalized to 1W input power.

2. SAR Measurement

Standard SAR-measurements were performed with the phantom according to the measurement conditions described in section 1. The results have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values are:

averaged over 1 cm ³ (1 g) of tissue:	44.4 mW/g
averaged over 10 cm ³ (10 g) of tissue:	22.1 mW/g

Note: If the liquid parameters for validation are slightly different from the ones used for initial calibration, the SAR-values will be different as well. The estimated sensitivities of SAR-values and penetration depths to the liquid parameters are listed in the DASY Application Note 4: 'SAR Sensitivities'.

3. Dipole Impedance and return loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	1.217 ns	(one direction)
Transmission factor:	0.993	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 1800 MHz:	$\text{Re}\{Z\} = 52.0\Omega$
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	$\text{Im}\{Z\} = -0.5\Omega$
--	-------------------------------

Return Loss at 1800 MHz	-34.3 dB
-------------------------	-----------------

4. Handling

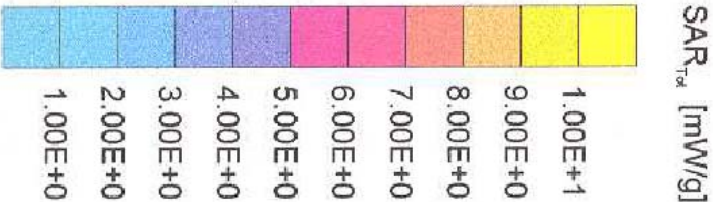
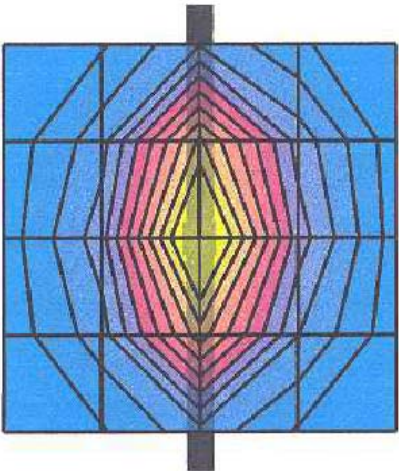
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

Do not apply excessive force to the dipole arms, because they might bend. If the dipole arms have to be bent back, take care to release stress to the soldered connections near the feedpoint; they might come off.

After prolonged use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

Validation Dipole D1800V2 SN:278, d = 10 mm

Frequency: 1800 MHz; Antenna Input Power: 250 [mW]
Generic Twin Phantom; Flat Section; Grid Spacing: Dx = 15.0, Dy = 15.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.67,5.67,5.67) at 1800 MHz; Brain 1800 MHz; $\sigma = 1.71$ mho/m $\rho_s = 40.0$ $\rho = 1.00$ g/cm³
Cubes (2): Peak: 22.1 mW/g ± 0.00 dB, SAR (1g): 11.1 mW/g ± 0.00 dB, SAR (10g): 5.52 mW/g ± 0.00 dB, (Worst-case extrapolation)
Penetration depth: 7.2 (6.8, 8.0) [mm]
Powerdrift: 0.02 dB



APPENDIX E
Illustration of Body-Worn Accessories

The purpose of this appendix is to illustrate the body-worn carry accessories for the data terminal model F4413A. The device that was used in the following photos represents the device used to obtain the results presented herein and was used in this section solely to demonstrate the different body-worn carry case accessories.



Photo 1.
Body worn accessory
Model UPS192010
Front view



Photo 2.
Body worn accessory
Model UPS192010
Side view



Photo 2.
Body worn accessory
Model UPS192010
Back view



Photo 4
Body worn accessory
Model UPS192010
User position

The following table summarizes the body spacing distance provided by each of the body-worn accessories:

Carry Case Model	Separation distance between device and phantom surface. (mm)
UPS192010	0.5