SAR EVALUATION REPORT

For

BK Radio Inc.

7100 Technology Drive
West Melbourne, FL 32904

FCC ID: K95DPH51

2003-05-15

This Report Concerns:	**Equipment Type:**
☒ Permissive Class II Change	VHF Portable Two-way Radio

Test Engineer:	Eric Hong
Report No.:	R0304232S
Test Date:	2003-04-29
Reviewed By:	Hans Mellberg
Prepared By:	Bay Area Compliance Laboratory Corporation 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

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SUMMARY

The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996 [1].

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

The investigation was limited to the worst-case scenario from the device usage point of view. For the clarity of data analysis, and clarity of presentation, only one tissue simulation was used for the head and body simulation. This means that if SAR was found at the headset position, the magnitude of SAR would be overestimated comparing to SAR to a headset placed in the ear region.

There was no SAR of any concern measured on the device for any of the investigated configurations, please see following table for testing result summary:

Ambient Temperature (ºC): 23.0
Relative Humidity (%): 51.1

Worst case SAR reading

EUT position	Frequency (MHz)	Conducted Power (W)	Test Type	Antenna Type	Liquid	Phantom	Notes / Accessories	Measured (mW/g)		Limit (mW/g)	Plot #
								100% duty cycle	50% duty cycle		
back in touch with phantom	148	6.01	Body worn	Built-in	body	flat	none	4.29	2.46	8	1
back in touch with phantom	162	6.02	Body worn	Built-in	body	flat	none	2.46	1.23	8	2
back in touch with phantom	174	5.90	Body worn	Built-in	body	flat	none	2.71	1.36	8	3
w/belt clip in touch with phantom	148	6.01	Body worn	Built-in	body	flat	Leather case w/belt clip, microphone	0.679	0.339	8	4
w/belt clip in touch with phantom	162	6.02	Body worn	Built-in	body	flat	Leather case w/belt clip, microphone	0.724	0.362	8	5
w/belt clip in touch with phantom	174	5.90	Body worn	Built-in	body	flat	Leather case w/belt clip, microphone	0.426	0.213	8	6
front to face at 2.5 cm	148	6.01	Face-held	Built-in	head	flat	none	0.110	0.055	8	7
front to face at 2.5 cm	162	6.02	Face-held	Built-in	head	flat	none	0.439	0.219	8	8
front to face at 2.5 cm	174	5.90	Face-held	Built-in	head	flat	none	0.115	0.058	8	9
front to face at 2.5 cm	148	6.01	Face-held	Built-in	head	flat	earphone	0.136	0.068	8	10
front to face at 2.5 cm	162	6.02	Face-held	Built-in	head	flat	earphone	0.277	0.139	8	11
front to face at 2.5 cm	174	5.90	Face-held	Built-in	head	flat	earphone	0.145	0.073	8	12

1 - REFERENCE

[1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.

[2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, O_ce of Engineering & Technology, Washington, DC, 1997.

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

[4] Niels Kuster, Ralph K.astle, and Thomas Schmid, \ Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.

[5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.

[6] ANSI, 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, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.

[7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM _ 97, Dubrovnik, October 15{17, 1997, pp. 120-24.

[8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-_eld probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172-175.

[9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. uhn, and Niels Kuster, \The depen-dence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.

[10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.

[11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.

[12] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.Dosimetric Evaluation of Sample device, month 1998 9

[13] NIS81 NAMAS, \The treatment of uncertainity in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.

[14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10

2 - TESTING EQUIPMENT

2.1 Equipment List & Calibration Info

Type / Model	Cal. Date	S/N:
DASY3 Professional Dosimetric System	N/A	N/A
Robot RX60L	N/A	F00/5H31A1/A/01
Robot Controller	N/A	F01/5J72A1/A/01
Dell Computer Optiplex GX110	N/A	N/A
Pentium III, Windows NT	N/A	N/A
SPEAG EDC3	N/A	N/A
SPEAG DAE3	6/02	456
SPEAG E-Field Probe ET3DV6	9/7/02	1604
SPEAG Dummy Probe	N/A	N/A
SPEAG Generic Twin Phantom	N/A	N/A
SPEAG Light Alignment Sensor	N/A	278
Apprel Validation Dipole D-1800-S-2	11/6/01	BCL-049
SPEAG Validation Dipole D900V2	9/3/02	122
Brain Equivalent Matter (800MHz)	Daily	N/A
Brain Equivalent Matter (1900MHz)	Daily	N/A
Brain Equivalent Matter (2450MHz)	Daily	N/A
Muscle Equivalent Matter (800MHz)	Daily	N/A
Muscle Equivalent Matter (1900MHz)	Daily	N/A
Muscle Equivalent Matter (2450MHz)	Daily	N/A
Robot Table	N/A	N/A
Phone Holder	N/A	N/A
Phantom Cover	N/A	N/A
HP Spectrum Analyzer HP8593GM	6/20/02	3009A00791
Microwave Amp. 8349B	N/A	2644A02662
Power Meter HP436A	4/2/02	2709A29209
Power Sensor HP8482A	4/2/02	2349A08568
Signal Generator RS SMIQ O3	2/10/02	1084800403
Network Analyzer HP-8753ES	7/30/02	820079
Dielectric Probe Kit HP85070A	N/A	N/A
Apprel Validation Dipole D-2450-S-1	10/1/02	BCL-141
Dipole Antenna AD-100 (450MHz)	5/7/02	02220

2.2 Equipment Calibration Certificate

Please see the attached file.

Engineering

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Additional Conversion Factors

for Dosimetric E-Field Probe

Type	ET3DV6
Serial Number:	1604
Place of Assessment	Zurich
Date of Assessment:	October 4, 2002
Probe Calibration Date:	August 26, 2002

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:

Conversion Factor (± standard deviation)

150 MHz	ConvF	**9.2 ± 8%**	$\varepsilon_r = 52.3$ $\sigma = 0.76$ mho/m (head tissue)
300 MHz	ConvF	**8.0 ± 8%**	$\varepsilon_r = 45.3$ $\sigma = 0.87$ mho/m (head tissue)
450 MHz	ConvF	**7.3 ± 8%**	$\varepsilon_r = 43.5$ $\sigma = 0.87$ mho/m (head tissue)
2450 MHz	ConvF	**4.7 ± 8%**	$\varepsilon_r = 39.2$ $\sigma = 1.80$ mho/m (head tissue)
150 MHz	ConvF	**8.8 ± 8%**	$\varepsilon_r = 61.9$ $\sigma = 0.80$ mho/m (body tissue)
450 MHz	ConvF	**7.7 ± 8%**	$\varepsilon_r = 56.7$ $\sigma = 0.94$ mho/m (body tissue)
2450 MHz	ConvF	**4.3 ± 8%**	$\varepsilon_r = 52.7$ $\sigma = 1.95$ mho/m (body tissue)

Schmid & Partner
Engineering AG

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Calibration Certificate

Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1604**
Place of Calibration:	**Zurich**
Date of Calibration:	**August 26, 2002**
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:	N. Vetter
Approved by:	[signature]

DASY3 - Parameters of Probe: ET3DV6 SN:1604

Sensitivity in Free Space

NormX	**1.73**	$\mu V/(V/m)^2$
NormY	**1.68**	$\mu V/(V/m)^2$
NormZ	**1.72**	$\mu V/(V/m)^2$

Diode Compression

DCP X	**93**	mV
DCP Y	**93**	mV
DCP Z	**93**	mV

Sensitivity in Tissue Simulating Liquid

Head **900 MHz** ε_r **= 41.5 ± 5%** σ **= 0.97 ± 5% mho/m**
Head **835 MHz** ε_r **= 41.5 ± 5%** σ **= 0.90 ± 5% mho/m**

ConvF X	**6.5** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**6.5** ± 9.5% (k=2)		Alpha	**0.36**
ConvF Z	**6.5** ± 9.5% (k=2)		Depth	**2.82**

Head **1800 MHz** ε_r **= 40.0 ± 5%** σ **= 1.40 ± 5% mho/m**
Head **1900 MHz** ε_r **= 40.0 ± 5%** σ **= 1.40 ± 5% mho/m**

ConvF X	**5.5** ± 9.5% (k=2)		Boundary effect:	
ConvF Y	**5.5** ± 9.5% (k=2)		Alpha	**0.50**
ConvF Z	**5.5** ± 9.5% (k=2)		Depth	**2.46**

Boundary Effect

Head **900 MHz** **Typical SAR gradient: 5 % per mm**

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	11.1	6.6
SAR_{be} [%]	With Correction Algorithm	0.4	0.6

Head **1800 MHz** **Typical SAR gradient: 10 % per mm**

Probe Tip to Boundary		**1 mm**	**2 mm**
SAR_{be} [%]	Without Correction Algorithm	12.3	8.1
SAR_{be} [%]	With Correction Algorithm	0.1	0.1

Sensor Offset

Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.3 ± 0.2**	mm

Body 450MHz Liquid Validation, Ambient Temp = 23∘C, Liquid Temp = 21∘C, 4/29/03

frequency	e'	e''
400000000.0000	56.8505	39.1741
402000000.0000	56.8680	39.1531
404000000.0000	56.9914	38.9635
406000000.0000	56.9256	38.6523
408000000.0000	56.6095	38.8442
410000000.0000	56.7104	38.6018
412000000.0000	56.6822	38.5489
414000000.0000	56.6595	38.4567
416000000.0000	56.6704	38.1728
418000000.0000	56.6675	38.1840
420000000.0000	56.5367	38.0549
422000000.0000	56.2925	38.0632
424000000.0000	56.3607	38.1617
426000000.0000	56.0763	37.9790
428000000.0000	55.8599	38.0417
430000000.0000	55.9141	38.1062
432000000.0000	55.7362	37.8325
434000000.0000	55.7707	37.7402
436000000.0000	55.9318	37.5476
438000000.0000	56.0013	37.1614
440000000.0000	56.1020	37.1844
442000000.0000	56.0774	37.0455
444000000.0000	55.9542	37.1233
446000000.0000	56.0473	36.1693
448000000.0000	55.8670	36.0614
450000000.0000	55.7696	36.9888
452000000.0000	55.8643	36.0625
454000000.0000	55.8360	36.8289
456000000.0000	55.9856	36.6241
458000000.0000	55.9898	36.5819
460000000.0000	56.0179	36.4274
462000000.0000	56.1341	36.1921
464000000.0000	56.1692	36.1142
466000000.0000	56.2136	35.9504
468000000.0000	56.2659	35.7921
470000000.0000	56.1101	35.7722
472000000.0000	56.3398	35.6794
474000000.0000	56.1987	35.6357
476000000.0000	56.3558	35.4892
478000000.0000	56.3428	35.4149
480000000.0000	56.2195	35.4016
482000000.0000	56.2365	35.3123
484000000.0000	56.1412	35.2309
486000000.0000	56.1734	35.1246
488000000.0000	56.1066	35.0895
490000000.0000	56.1866	34.9227
492000000.0000	56.1828	34.8957
494000000.0000	56.1680	34.8325
496000000.0000	56.2370	34.7830
498000000.0000	56.1973	34.6821
500000000.0000	56.1711	34.6235

$\sigma = \omega\ \varepsilon_o\ \varepsilon'' = 2\ \pi\ f\ \varepsilon_o\ \varepsilon'' = 0.93$

where $f = 450$

$\varepsilon_o = 8.854 \times 10^{-12}$

$\varepsilon'' = 36.9888$

Head 450MHz Liquid Validation, Ambient Temp = 23◦C, Liquid Temp = 21◦C, 4/29/03

frequency	e'	e''
400000000.0000	43.8405	35.1740
402000000.0000	43.8580	35.1531
404000000.0000	44.9514	34.8635
406000000.0000	44.9856	34.1523
408000000.0000	44.7095	34.8442
410000000.0000	44.7114	34.6018
412000000.0000	44.7832	34.5489
414000000.0000	44.7585	34.4567
416000000.0000	44.6714	34.1928
418000000.0000	44.6675	34.1840
420000000.0000	44.5367	34.1549
422000000.0000	44.2925	34.2632
424000000.0000	44.3607	34.3617
426000000.0000	44.0763	33.4790
428000000.0000	43.8594	34.5417
430000000.0000	43.9143	34.3062
432000000.0000	43.7365	33.5325
434000000.0000	43.7706	33.6402
436000000.0000	43.9317	33.7476
438000000.0000	43.0213	33.5614
440000000.0000	43.1021	33.3844
442000000.0000	42.0775	33.4455
444000000.0000	42.9543	33.1253
446000000.0000	42.0453	33.1693
448000000.0000	42.8671	33.5644
450000000.0000	42.7695	33.9818
452000000.0000	42.5643	33.8625
454000000.0000	42.5360	33.8279
456000000.0000	42.6856	33.6242
458000000.0000	43.6898	33.5818
460000000.0000	43.4179	33.4264
462000000.0000	43.3341	32.1923
464000000.0000	43.3692	32.2142
466000000.0000	43.2136	31.8504
468000000.0000	43.2657	32.8721
470000000.0000	43.1101	32.8512
472000000.0000	43.3391	32.6794
474000000.0000	43.1987	32.6355
476000000.0000	43.3558	32.4882
478000000.0000	43.3425	32.4349
480000000.0000	44.2195	32.4216
482000000.0000	44.2365	32.7123
484000000.0000	44.2412	32.3309
486000000.0000	44.1734	32.1246
488000000.0000	44.1766	32.3895
490000000.0000	44.1366	31.4227
492000000.0000	44.1728	31.4957
494000000.0000	44.1580	31.4325
496000000.0000	44.2470	31.4830
498000000.0000	44.1983	31.5821
500000000.0000	44.1712	31.5235

$\sigma = \omega\, \varepsilon_o\, \varepsilon'' = 2\, \pi\, f\, \varepsilon_o\, \varepsilon'' = 0.85$

where $f = 450$

$\varepsilon_o = 8.854 \times 10^{-12}$

$\varepsilon'' = 33.9818$

Body 150MHz Liquid Validation, Ambient Temp = 23◦C, Liquid Temp = 22◦C, 4/29/03

Frequency	e'	e''
100000000.0000	76.6011	103.8900
102000000.0000	75.3741	103.3748
104000000.0000	74.7552	103.1172
106000000.0000	73.6432	102.4242
108000000.0000	72.8142	102.3522
110000000.0000	71.5136	101.5716
112000000.0000	71.0699	101.4341
114000000.0000	70.2819	101.1203
116000000.0000	69.4673	100.2962
118000000.0000	68.7239	99.6752
120000000.0000	68.2054	99.8761
122000000.0000	66.9348	99.2794
124000000.0000	66.5143	98.6608
126000000.0000	65.9211	98.3937
128000000.0000	65.3662	98.3090
130000000.0000	64.8454	97.4897
132000000.0000	64.5271	97.3978
134000000.0000	63.8503	96.9291
136000000.0000	63.5861	96.6391
138000000.0000	62.8092	96.2723
140000000.0000	62.3461	96.1659
142000000.0000	61.6475	95.4532
144000000.0000	62.1700	95.4468
146000000.0000	61.2963	94.9025
148000000.0000	61.0422	94.0316
150000000.0000	61.1494	94.8177
152000000.0000	61.1684	94.0544
154000000.0000	59.4539	93.9713
156000000.0000	59.6679	93.5610
158000000.0000	58.9707	93.4157
160000000.0000	58.8450	92.9919
162000000.0000	58.2435	92.8316
164000000.0000	58.0519	92.6362
166000000.0000	57.5816	92.3573
168000000.0000	57.3512	92.0157
170000000.0000	57.1522	91.7475
172000000.0000	56.7472	91.5253
174000000.0000	56.3179	91.1668
176000000.0000	56.2567	90.9473
178000000.0000	55.9858	90.6335
180000000.0000	55.4629	90.2194
182000000.0000	54.9903	90.1205
184000000.0000	54.5980	89.8853
186000000.0000	54.3982	89.5113
188000000.0000	53.9940	89.1734
190000000.0000	53.5744	89.1171
192000000.0000	53.4446	88.6970
194000000.0000	52.8832	88.3745
196000000.0000	52.5538	88.1571
198000000.0000	52.4737	87.7956
200000000.0000	52.2436	87.4911

$\sigma = \omega\ \varepsilon_o\ \varepsilon'' = 2\ \pi\ f\ \varepsilon_o\ \varepsilon'' = 0.79$

where $f = 150$

$\varepsilon_o = 8.854 \times 10^{-12}$

$\varepsilon'' = 94.8177$

Head 150MHz Liquid Validation, Ambient Temp = 23°C, Liquid Temp = 22°C, 4/29/03

frequency	e'	e''
100000000.0000	55.8180	110.4901
102000000.0000	55.2778	109.1488
104000000.0000	55.0947	107.4585
106000000.0000	55.2943	105.9375
108000000.0000	54.6028	103.5744
110000000.0000	54.9643	101.8739
112000000.0000	54.0170	101.9445
114000000.0000	54.1331	101.4921
116000000.0000	54.0364	99.6542
118000000.0000	53.9261	98.2548
120000000.0000	53.5208	97.1170
122000000.0000	53.5720	95.2446
124000000.0000	53.4280	94.5949
126000000.0000	53.0761	93.2892
128000000.0000	53.2227	92.4408
130000000.0000	52.9422	91.3598
132000000.0000	52.4582	90.4164
134000000.0000	52.3296	89.4084
136000000.0000	52.4079	98.2844
138000000.0000	52.5469	97.9480
140000000.0000	52.0877	96.9822
142000000.0000	52.0911	96.0055
144000000.0000	51.9036	95.1933
146000000.0000	51.9767	94.3408
148000000.0000	51.5912	93.7088
150000000.0000	51.9432	92.9547
152000000.0000	50.8434	92.3992
154000000.0000	50.4321	92.8223
156000000.0000	50.5798	91.0792
158000000.0000	50.5467	90.2402
160000000.0000	50.0929	89.6256
162000000.0000	50.2318	88.6459
164000000.0000	50.2826	87.5538
166000000.0000	50.5442	86.2277
168000000.0000	50.5050	86.2043
170000000.0000	50.3948	85.8818
172000000.0000	50.0377	85.1244
174000000.0000	49.9466	84.5756
176000000.0000	49.7023	83.9975
178000000.0000	49.3736	83.2603
180000000.0000	49.5515	82.8138
182000000.0000	49.3794	82.2188
184000000.0000	49.1227	81.7096
186000000.0000	48.8525	81.4831
188000000.0000	48.8316	81.0319
190000000.0000	48.4695	80.5938
192000000.0000	48.3264	79.9751
194000000.0000	48.1623	79.4314
196000000.0000	48.0817	79.1712
198000000.0000	48.2509	78.6758
200000000.0000	48.1890	77.9117

$\sigma = \omega\ \varepsilon_o\ \varepsilon'' = 2\ \pi\ f\ \varepsilon_o\ \varepsilon'' = 0.78$

where $f = 150$

$\varepsilon_o = 8.854 \times 10^{-12}$

$\varepsilon'' = 92.9547$

3 - EUT DESCRIPTION

FCC ID:	K95DPH51
Applicant:	BK Radio Inc.
Product Description:	VHF Portable Two-way Radio (prototype)
Product Name:	DPH51
Serial Number:	None
Transmitter Frequency:	148~174MHz
Maximum Output Power:	Measured: 6.02W; Typical: 5W
Dimension:	2.5” L x 1.5”W x 13”H approximately
RF Exposure environment:	Occupational
Power Supply:	BK Radio Battery Charger, M/N: LAA0342
Applicable Standard	FCC CFR 47, Part 22, 74, 80 & 90
Application Type:	Certification

1 Specific Absorption Rate (SAR) is a measure of the rate of energy absorption due to exposure to an RF transmitting source (wireless portable device).
2 IEEE/ANSI Std. C95.1-1992 limits are used to determine compliance with FCC ET Docket 93-62.

Note: The test data was good for test sample only. It may have deviation for other test samples.

4 - SYSTEM TEST CONFIGURATION

4.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

4.2 EUT Exercise Procedure

The EUT exercising program used during SAR testing was designed to exercise the various system components in a manner similar to a typical use. The EUT was tested by pushing the PTT bottom during the testing.

4.3 Special Accessories

All interface cables used for compliance testing are shielded as normally supplied by INMAC, Monster Cable and their respective support equipment manufacturer. The EUT is featured shielded metal connectors.

4.4 Equipment Modifications

No modification(s) were made to ensure that the EUT complies with the applicable limits.

5 - CONDUCTED OUTPUT POWER MEASUREMENT

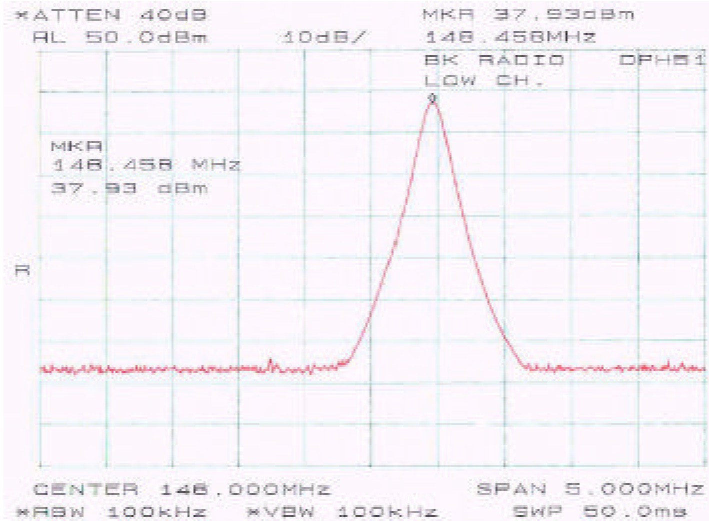
5.1 Measurement Procedure

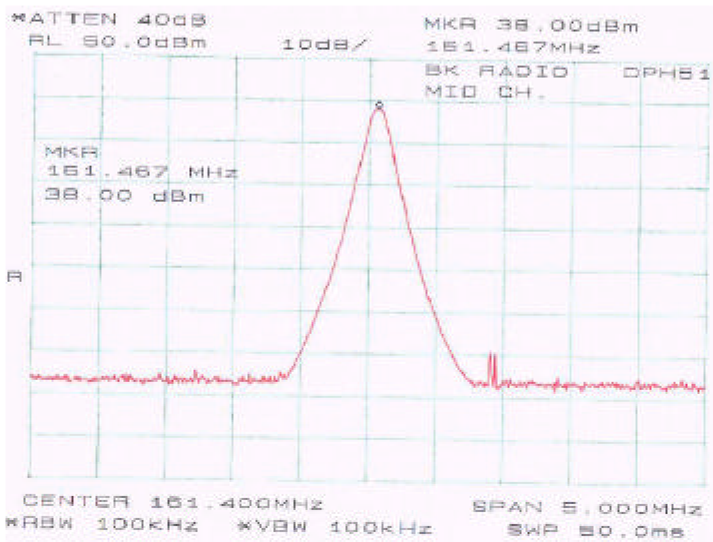
1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.

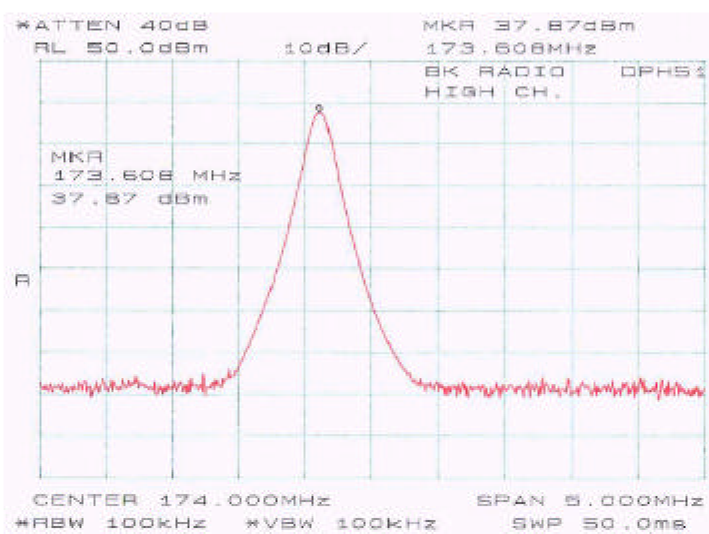
5.2 Test Results

Channel	Output Power in W	Voltage V	Current A
148.05	6.2	10.0	1.63
161.467	6.31	10.0	1.61
173.95	6.1	10.0	1.62

Note: The power output may depend on the intended use of the EUT. For all tests, the EUT was set to maximum conditions.


*ATTEN 40dB
RL 50.0dBm 10dB/
MKR 37.93dBm
148.458MHz
BK RADIO DPH51
LOW CH.
MKR
148.458 MHz
37.93 dBm
CENTER 148.000MHz SPAN 5.000MHz
*RBW 100kHz *VBW 100kHz SWP 50.0ms


*ATTEN 40dB
RL 50.0dBm 10dB/
MKR 38.00dBm
161.467MHz
BK RADIO DPH51
MID CH.
MKR
161.467 MHz
38.00 dBm
CENTER 161.400MHz SPAN 5.000MHz
*RBW 100kHz *VBW 100kHz SWP 50.0ms


*ATTEN 40dB
RL 50.0dBm 10dB/
MKR 37.87dBm
173.608MHz
BK RADIO DPH51
HIGH CH.
MKR
173.608 MHz
37.87 dBm
CENTER 174.000MHz SPAN 5.000MHz
*RBW 100kHz *VBW 100kHz SWP 50.0ms

6 - DOSIMETRIC ASSESSMENT SETUP

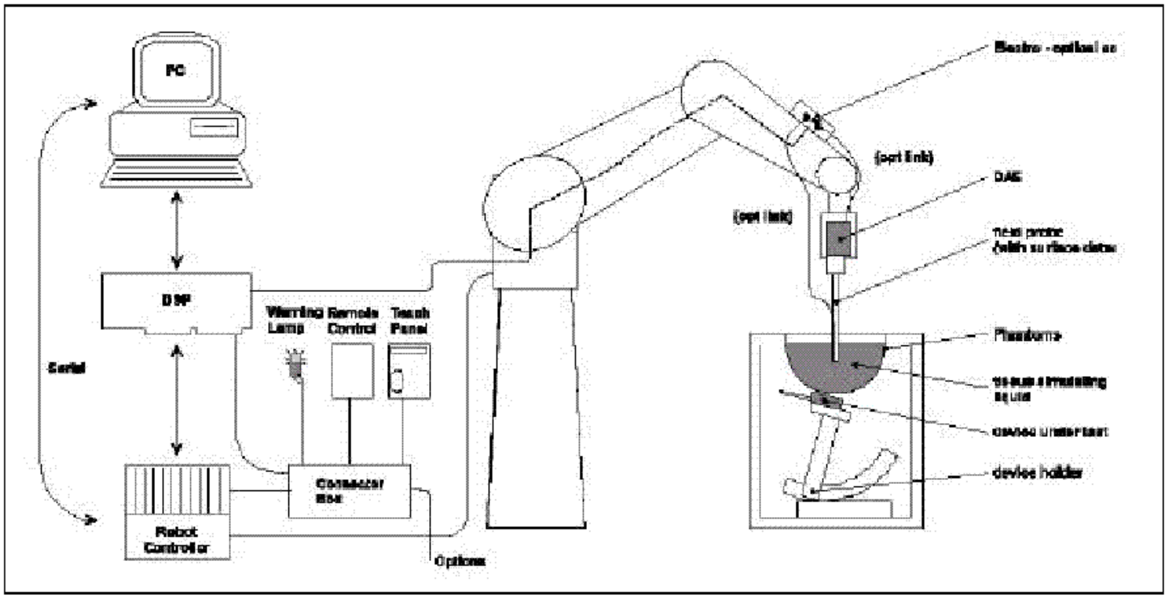
These measurements were performed with the automated near-field scanning system DASY3 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9m) which positions the probes with a positional repeatability of better than ±0.02mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The system is described in detail in [3].

The SAR measurements were conducted with the dosimetric probe ET3DV6 SN: 1604 (manufactured by SPEAG), designed in the classical triangular configuration [3] and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [7] with accuracy of better than ±10%. The spherical isotropy was evaluated with the procedure described in [8] and found to be better than ±0.25dB.

The phantom used was the \Generic Twin Phantom” described in [4]. The ear was simulated as a spacer of 4 mm thickness between the earpiece of the phone and the tissue simulating liquid. The Tissue simulation liquid used for each test is in according with the FCC OET65 supplement C as listed below.

Ingredients (% by weight)	Frequency (MHz) 450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (Nacl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	55.2	42.0	55.9	39.9	53.3	39.8	53.6
Conductivity (s/m)	0.85	0.83	0.91	0.97	1.0	0.98	1.42	1.52	1.88	1.81

6.1 Measurement System Diagram



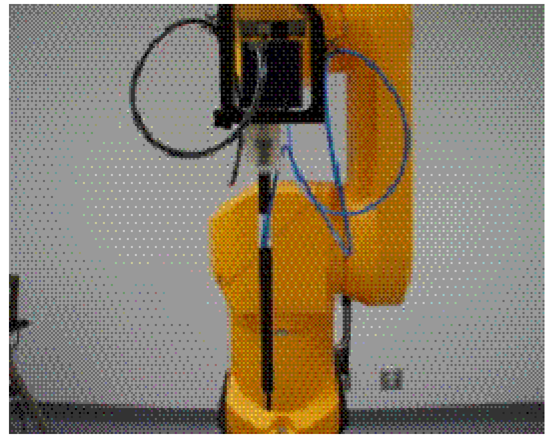
The DASY3 system for performing compliance tests consist of the following items:

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
2. An arm extension for accommodating the data acquisition electronics (DAE).
3. A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
4. A data acquisition electronic (DAE), which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
5. A unit to operate the optical surface detector, which is connected to the EOC. The Electro-optical coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the PC plug-in card. The functions of the PC plug-in card based on a DSP is to perform the time critical task such as signal filtering, surveillance of the robot operation fast movement interrupts.
6. A computer operating Windows 95 or larger
7. DASY3 software
8. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.
9. The generic twin phantom enabling testing left-hand and right-hand usage.
10. The device holder for handheld EUT.
11. Tissue simulating liquid mixed according to the given recipes (see Application Note).
12. System validation dipoles to validate the proper functioning of the system.

6.2 System Components

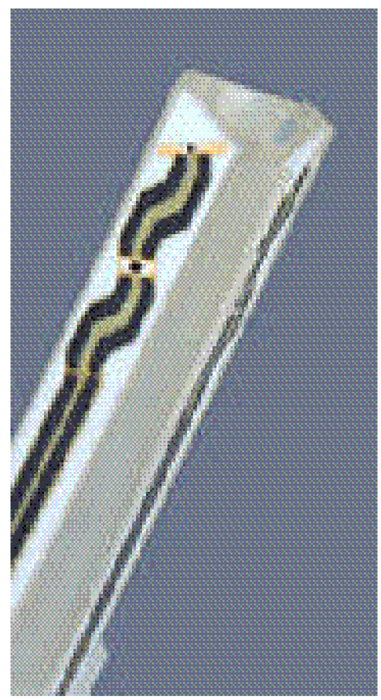
ET3DV6 Probe Specification

Construction Symmetrical design with triangular core
Built-in optical fiber for surface detection System
Built-in shielding against static charges
Calibration In air from 10 MHz to 2.5 GHz
In brain and muscle simulating tissue at
Frequencies of 450 MHz, 900 MHz and
1.8 GHz (accuracy ± 8%)
Frequency 10 MHz to > 6 GHz; Linearity: ± 0.2 dB
(30 MHz to 3 GHz)
Directivity ± 0.2 dB in brain tissue (rotation around
probe axis)
± 0.4 dB in brain tissue (rotation normal probe axis)
Dynamic 5 mW/g to > 100 mW/g;
Range Linearity: ± 0.2 dB
Surface ± 0.2 mm repeatability in air and clear liquids
Detection over diffuse reflecting surfaces.
Dimensions Overall length: 330 mm
Tip length: 16 mm
Body diameter: 12 mm
Tip diameter: 6.8 mm
Distance from probe tip to dipole centers: 2.7 mm
Application General dosimetric up to 3 GHz
Compliance tests of mobile phones
Fast automatic scanning in arbitrary phantoms



Photograph of the probe

The SAR measurements were conducted with the dosimetric probe ET3DV6 designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY3 software reads the reflection during a software approach and looks for the maximum using a 2 nd order fitting. The approach is stopped when reaching the maximum.



Inside view of ET3DV6 E-field Probe

E-Field Probe Calibration Process

Each probe is calibrated according to a dosimetric assessment procedure described in [6] with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in [7] and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a waveguide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

Data Evaluation

The DASY3 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe Parameter:	-Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	-Conversion Factor	ConvFi
	-Diode compression point	Dcp_i
Device parameter:	-Frequency	f
	-Crest Factor	cf
Media parameter:	-Conductivity	ó
	-Density	ñ

These parameters must be set correctly in the software. They can either be found in the component documents or be imported into the software from the configuration files issued for the DASY3 components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$Vi = Ui + (Ui)^2 \, cf / dcp_i$$

With Vi = compensated signal of channel i (i =x, y, z)
Ui = input signal of channel i (i =x, y, z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes: $$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

H-field probes: $$H_i = \sqrt{Vi} \cdot \frac{a_{i0} + a_{i1} f + a_{i2} f^2}{f}$$

With Vi = compensated signal of channel i (i =x, y, z)
$Norm_i$ = sensor sensitivity of channel i (i =x, y, z)
ìV/ (V/m)^2 for E-field probes
ConF = sensitivity enhancement in solution
a_{ij} = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strenggy of channel i in V/m
H_i = diode compression point (DASY parameter)

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = \text{Square Root } [(E_x)^2 + (E_y)^2 + (E_z)^2]$$

The primary field data are used to calculate the derived field units.

$$SAR = (E_{tot})^2 \text{ ó } /(\text{ñ } 1000)$$

With SAR = local specific absorption rate in mW/g
E_{tot} = total field strength in V/m
ó = conductivity in [mho/m] or [Siemens/m]
ñ = equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

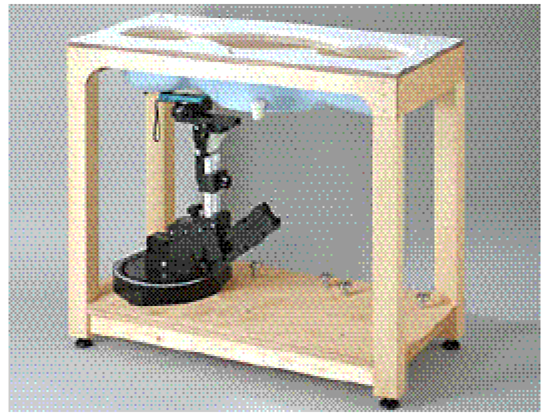
The power flow density is calculated assuming the excitation field as a free space field.

$$P_{pwe} = (E_{tot})^2 / 3770 \text{ or } P_{pwe} = (H_{tot})2 \quad 37.7$$

With P_{pwe} = equivalent power density of a plane wave in mW/cm3
E_{tot} = total electric filed strength in V/m
H_{tot} = total magnetic filed strength in V/m

Generic Twin Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users [9][10]. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allows the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.
Shell Thickness 2 ± 0.1 mm
Filling Volume Approx. 20 liters
Dimensions 810 x 1000 x 500 mm (H x L x W)

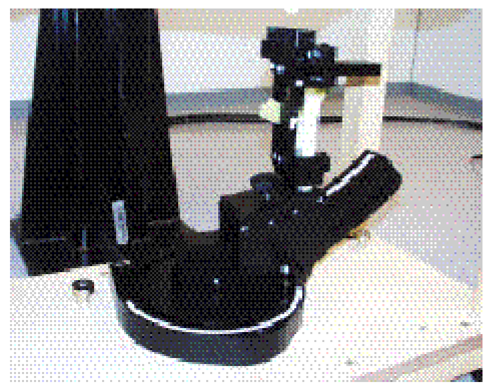


Generic Twin Phantom

Device Holder

In combination with the Generic Twin Phantom V3.0, the Mounting Device enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

* Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations [10]. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.



Device Holder

6.3 Measurement Uncertainty

The uncertainty budget has been determined for the DASY3 measurement system according to the NIS81 [13] and the NIST1297 [14] documents and is given in the following Table.

Measurement Uncertainty Analysis per IEEE P1528-2002								
Description	Section	Reported Variance (%)	Probability Distribution type	Divisor	Ci (1g)	Ui (1g)	Vi	welc/satt series term
Probe Calibration	E.2.1	4.80	N	1	1	4.80	1.00E+09	5.30842E-07
Axial isotropy	E.2.2	4.70	R	1.732	0.707107	1.92	1.00E+09	1.35563E-08
Hemispherical isotropy	E.2.2	9.60	R	1.732	0.707107	3.92	1.00E+09	2.35957E-07
Boundary effects	E.2.3	8.30	R	1.732	1	4.79	1.00E+09	5.27377E-07
Linearity	E.2.4	4.70	R	1.732	1	2.71	1.00E+09	5.4225E-08
System Detection Limit	E.2.5	1.00	R	1.732	1	0.58	1.00E+09	1.11124E-10
Readout Electronics	E.2.6	0.00	N	1	1	0.00	1.00E+09	0
Response time	E.2.7	0.00	R	1.732	1	0.00	1.00E+09	0
Integration time	E.2.8	0.00	R	1.732	1	0.00	1.00E+09	0
RF Ambient conditions	E.6.1	3.00	R	1.732	1	1.73	1.00E+09	9.00106E-09
Probe positioning mechanical tolerance	E.6.2	0.40	R	1.732	1	0.23	1.00E+09	2.84478E-12
Probe positioning wrt phantom shell	E.6.3	2.90	R	1.732	1	1.67	1.00E+09	7.8596E-09
Extra/inter-polation & integration algorithmsfor max SAR evaluation	E.5.2	3.90	R	1.732	1	2.25	1.00E+09	2.57079E-08
Test sample positioning	8, E.4.2	6.00	R	1.732	1	3.46	1.00E+09	1.44017E-07
Device holder distance tolerance	E.4.1	5.00	N	1	1	5.00	1.00E+09	0.000000625
Output power and SAR drift measurement	8, E.6.6.2	5.00	R	1.732	1	2.89	1.00E+09	6.94526E-08
Phantom uncertainty, shell thickness tolerance	E.3.1	4.00	R	1.732	1	2.31	1.00E+09	2.84478E-08
Liquid conductivity, deviation from target values	E.3.2	5.00	R	1.732	0.64	1.85	1.00E+09	1.16522E-08
Liquid conductivity, measurement uncertainty	E.3.3	5.00	N	1	0.64	3.20	5	20.97152
Liquid permitivity, deviation from target values	E.3.2	5.00	R	1.732	0.6	1.73	1.00E+09	9.00106E-09
Liquid permitivity, measurement uncertainty	E.3.3	5.00	N	1	0.6	3.00	5	16.2
								689
Probe isotropy sensitivity coefficient	**0.5**							
Combined Standard Uncertainty						**12.65**	**%**	
Expanded Uncertainty, 95% confidence		**k=**	**2.004**			**25.34**	**%**	

7 - SYSTEM EVALUATION

7.1 Simulated Tissue Liquid Parameter Confirmation

The dielectric parameters were checked prior to assessment using the HP85070A dielectric probe kit. The dielectric parameters measured are reported in each correspondent section:

7.2 Evaluation Procedures

Maximum Search

The maximum search is automatically performed after each coarse scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacings. After the coarse scan measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations.

Extrapolation

The extrapolation can be used in z-axis scans with automatic surface detection. The SAR values can be extrapolated to the inner phantom surface. The extrapolation distance is the sum of the probe sensor offset, the surface detection distance and the grid offset. The extrapolation is based on fourth order polynomal functions. The extrapolation is only available for SAR values.

Boundary Corrections

The correction of the probe boundary effect in the vicinity of the phantom surface can be done in two different ways. In the standard (worse case) evaluation, the boundary effect is reduced by different weights for the lowest measured points in the extrapolation routine. The result is a slight overestimation of the extrapolated SAR values (2% to 8%) depending on the SAR distribution and gradient. The advanced evaluation makes a full compensation of the boundary effect before doing the extrapolation. This is only possible of probes with specifications on the boundary effect.

Peak Search for 1g and 10g cube averaged SAR

The 1g and 10g peak evaluations are only available for the predefined cube 4x4x7 and cube 5x5x7 scans. The routine are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 32x32x35mm contains about 35g of tissue. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation get all points within the measured volume in a 1mm grid (35000 points). In the last step, a 1g cube is place numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. This last procedure is repeated for a 10g cube. If the highest SAR is found at the edge of the measured volume, the system will issue a warning,: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

7.3 System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

IEEE P1528 recommended reference value

Frequency (MHz)	1 g SAR	10 g SAR	Local SAR at surface (above feed point)	Local SAR at surface (v=2cm offset from feed point)
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

Validation Dipole SAR Reference Test Result for Body (450 MHz)

Validation Measurement	SAR @ 9.225mW Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 9.225mW Input averaged over 10g	SAR @ 1W Input averaged over 10g
Test 1	0.0451	0.89	0.0315	3.4
Test 2	0.0447	4.85	0.0312	3.38
Test 3	0.0448	4.86	0.0313	3.39
Test 4	0.0450	4.88	0.0313	3.39
Test 5	0.0451	4.89	0.0313	3.39
Test 6	0.0450	4.88	0.0315	3.4
Test 7	0.0451	4.89	0.0314	3.4
Test 8	0.0449	4.87	0.0312	3.38
Test 9	0.0449	4.87	0.0312	3.38
Test 10	0.0448	4.86	0.0311	3.37
Average	0.0449	4.874	0.0313	3.388

System validation result

4/29/03

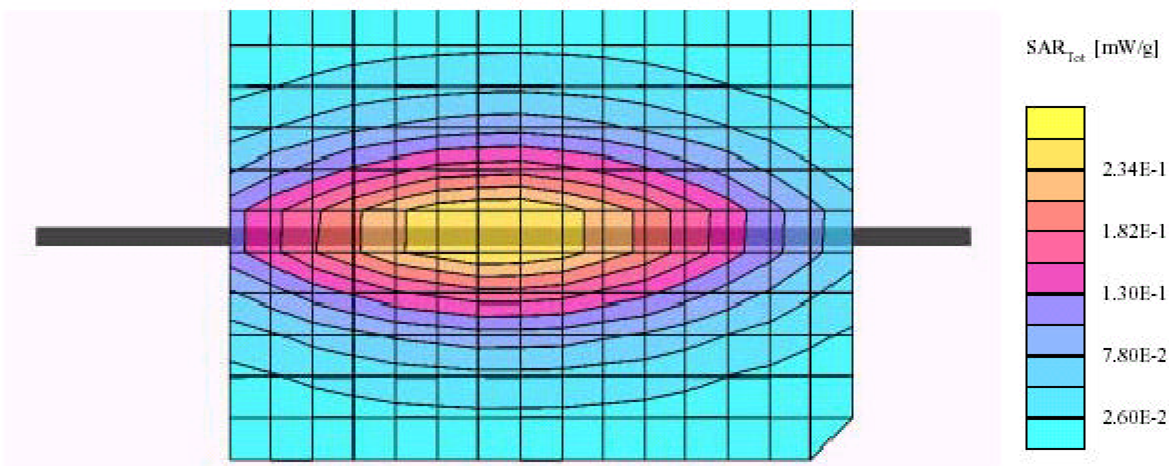
Ambient Temperature (ºC): 23.0
Relative Humidity (%): 49.3

Simulant	Freq [MHz]	Parameters	Liquid Temp [ºC]	Target Value	Measured Value	Deviation [%]	Limits [%]
Body	450	ε	21	56.7	55.8	-1.59	±5
		σ	21	0.94	0.93	-1.06	±5
		1g SAR	21	4.874	4.79	-1.72	±10
Head	450	ε	21	43.5	42.8	-1.61	±5
		σ	21	0.87	0.85	-2.30	±5
		1g SAR	21	4.9	4.82	-1.63	±10

ε = relative permittivity, σ = conductivity and ρ=1000kg/m^3
Note: Forward power = 17.14dBm = 51.77mW (body)
Forward power = 17.37dBm = 54.56mW (head)

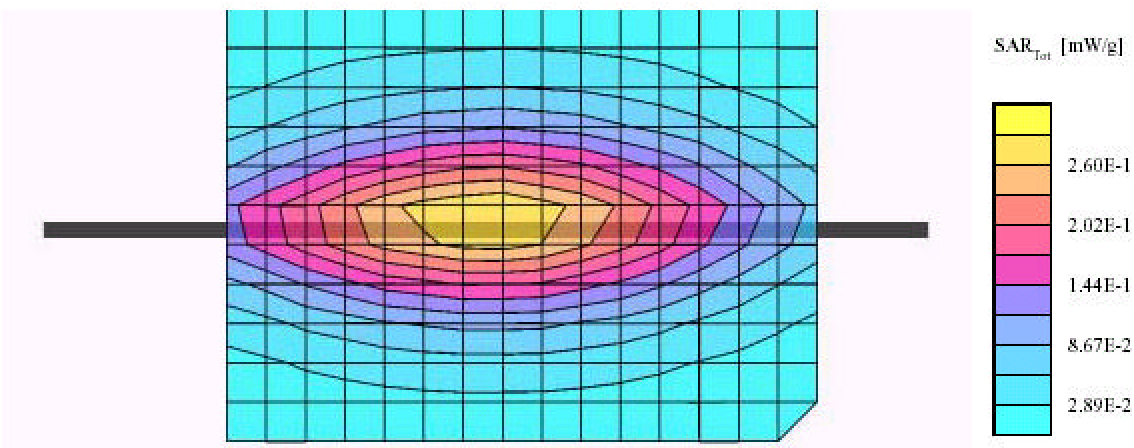
450 MHz Body Liquid System Validation (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/29/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 450 MHz
Probe: ET3DV6 - SN1604; ConvF(7.70,7.70,7.70); Crest factor: 1.0; Body 450 MHz: σ = 0.93 mho/m ε_r = 55.8 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.248 mW/g, SAR (10g): 0.168 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



450 MHz Head Liquid System Validation (Ambient Temp = 23 Deg C, Liquid Temp = 21 Deg C, 4/29/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 450 MHz
Probe: ET3DV6 - SN1604; ConvF(7.30,7.30,7.30); Crest factor: 1.0; Head 450 MHz: σ = 0.85 mho/m ε_r = 42.8 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 0.263 mW/g ± 0.04 dB, SAR (10g): 0.173 mW/g ± 0.02 dB, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.04 dB



7.4 SAR Evaluation Procedure

a. The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For device held to the dear during normal operation, both the left and right ear positions were evaluated in accordance with FCC OET Bulletin 65, Supplement C (Edition 01-01) using the SAM phantom. For body-worn and face-held devices a planar phantom was used. The EUT in the test setup for body-worn and face-held devices was placed in three different positions (relative to the phantom): with belt clip, without belt clip and 2.5cm facing left head side and 2.5cm facing right head side.
b. The SAR was determined by a pre-defined procedure within the DASY3 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 20mm x 20mm.
c. A 5x5x7 matrix was performed around the greatest special SAR distribution found during the area scan of the applicable exposed region. SAR values were then calculated using a 3-D spline interpolation algorithm and averaged over spatial volumes of 1 and 10 grams.
d. The depth of the simulating tissue in the planar used for the SAR evaluation and system validation was no less than 15.0cm.
e. For this particular evaluation, a stack of low-density, low-loss dielectric foamed polystyrene was used in place of the device holder.
f. Re-measurement of the SAR value at the same location as in a. If the value changed by more than 5%, the evaluation was repeated.

7.5 Exposure Limits

Table 1: Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands. Wrists. Feet and Ankles
0.4	8.0	20.0

Table 2: Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands. Wrists. Feet and Ankles
0.08	1.6	4.0

Note: Whole-body SAR is averaged over the entire body, partial-body SAR is averaged over any 1 gram of tissue defined as a tissue volume in the shape of a cube SAR for hands, writs, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

Population/uncontrolled environments Partial-body limit 1.6W/kg applied to the EUT.

8 - TEST RESULTS

This page summarizes the results of the performed dosimetric evaluation. The plots with the corresponding SAR distributions, which reveal information about the location of the maximum SAR with respect to the device could be found in the following pages.

According to the data in section 8.1, the EUT complied with the FCC 2.1093 RF Exposure standards, with worst case of **4.29mW/g**.

8.1 SAR Test Data

Ambient Temperature (ºC): 23.0
Relative Humidity (%): 51.1

Worst case SAR reading

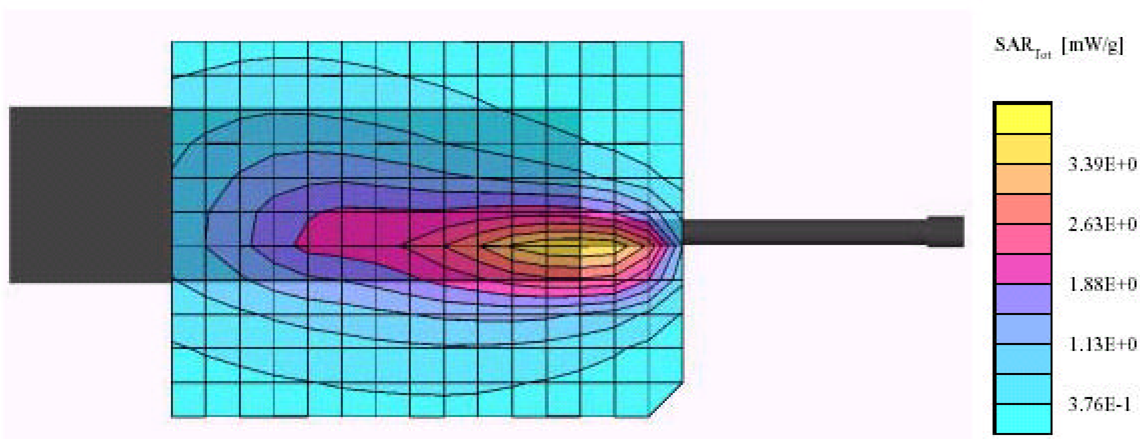
EUT position	Frequency (MHz)	Conducted Power (W)	Test Type	Antenna Type	Liquid	Phantom	Notes / Accessories	Measured (mW/g)		Limit (mW/g)	Plot #
								100% duty cycle	50% duty cycle		
back in touch with phantom	148	6.01	Body worn	Built-in	body	flat	none	4.29	2.46	8	1
back in touch with phantom	162	6.02	Body worn	Built-in	body	flat	none	2.46	1.23	8	2
back in touch with phantom	174	5.90	Body worn	Built-in	body	flat	none	2.71	1.36	8	3
w/belt clip in touch with phantom	148	6.01	Body worn	Built-in	body	flat	Leather case w/belt clip, microphone	0.679	0.339	8	4
w/belt clip in touch with phantom	162	6.02	Body worn	Built-in	body	flat	Leather case w/belt clip, microphone	0.724	0.362	8	5
w/belt clip in touch with phantom	174	5.90	Body worn	Built-in	body	flat	Leather case w/belt clip, microphone	0.426	0.213	8	6
front to face at 2.5 cm	148	6.01	Face-held	Built-in	head	flat	none	0.110	0.055	8	7
front to face at 2.5 cm	162	6.02	Face-held	Built-in	head	flat	none	0.439	0.219	8	8
front to face at 2.5 cm	174	5.90	Face-held	Built-in	head	flat	none	0.115	0.058	8	9
front to face at 2.5 cm	148	6.01	Face-held	Built-in	head	flat	earphone	0.136	0.068	8	10
front to face at 2.5 cm	162	6.02	Face-held	Built-in	head	flat	earphone	0.277	0.139	8	11
front to face at 2.5 cm	174	5.90	Face-held	Built-in	head	flat	earphone	0.145	0.073	8	12

8.2 Plots of Test Result

The plots of test result were attached as reference.

BK Radio, DPH51 (Back in touch with flat phantom, Low channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)

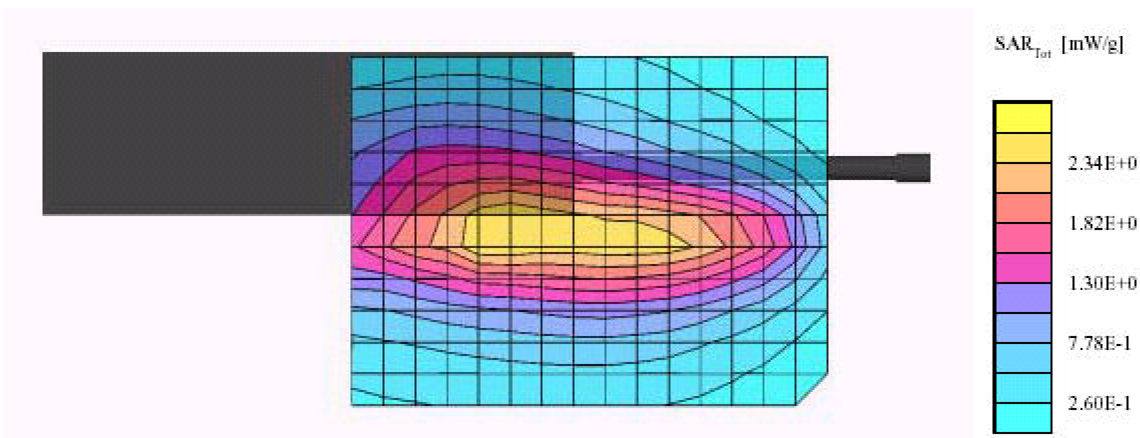
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 148 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.79 mho/m ε_r = 61.1 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 4.29 mW/g ± 0.19 dB, SAR (10g): 2.42 mW/g ± 0.26 dB, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



Plot #1

BK Radio, DPH51 (Back in touch with flat phantom, Middle channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)

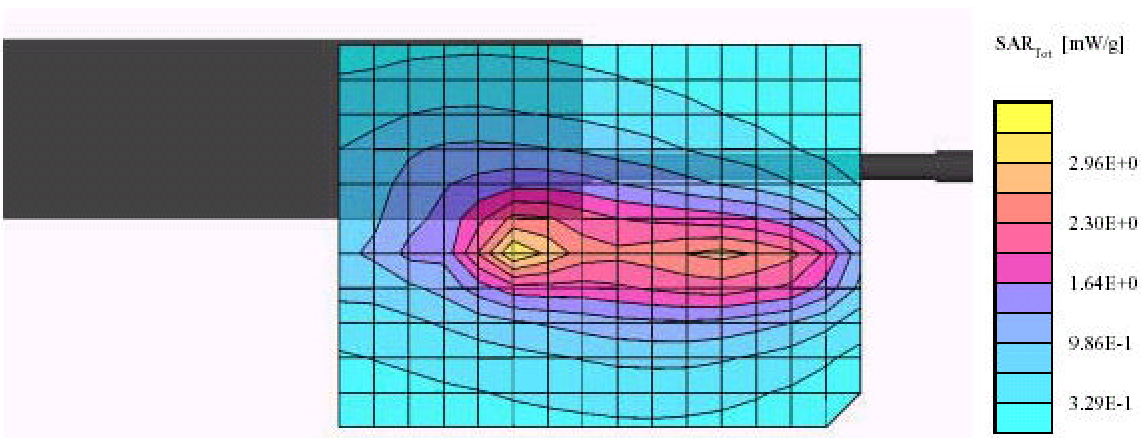
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 162 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.79 mho/m ϵ_r = 61.1 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 2.46 mW/g ± 0.04 dB, SAR (10g): 1.56 mW/g ± 0.24 dB, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.00 dB



Plot #2

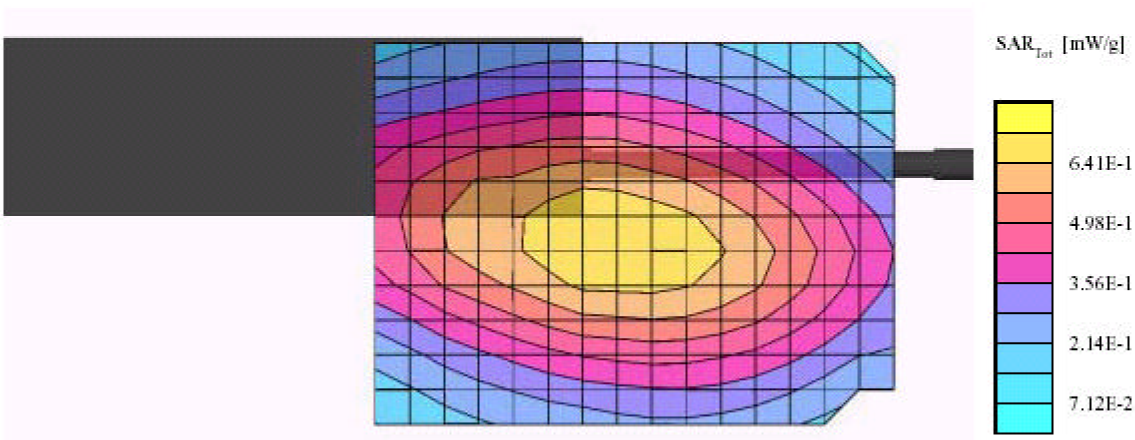
BK Radio, DPH51 (Back in touch with flat phantom, High channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 174 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.79 mho/m ε_r = 61.1 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 2.71 mW/g, SAR (10g): 1.61 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



Plot #3

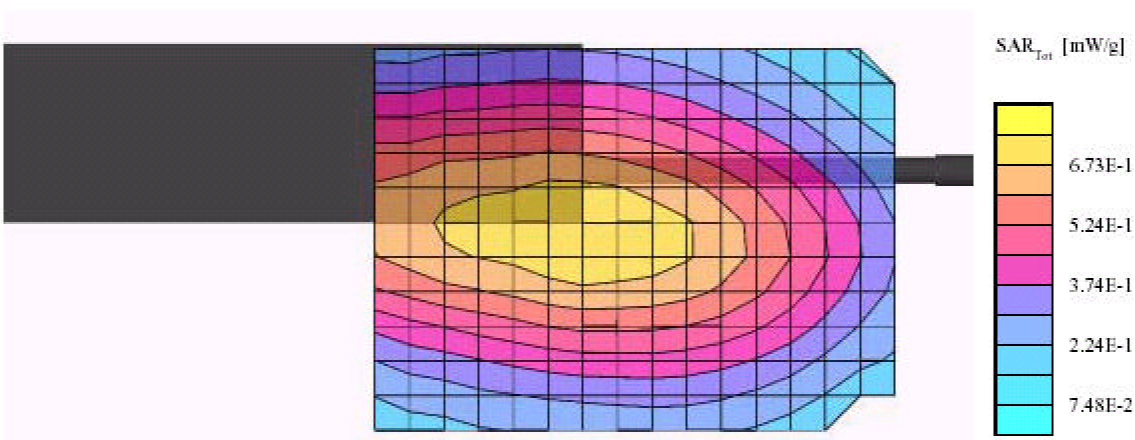
BK Radio, DPH51 (Leather case with belt clip and microphone touching flat phantom, Low channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 148 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.79 mho/m ε_r = 61.1 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.679 mW/g, SAR (10g): 0.516 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



Plot #4

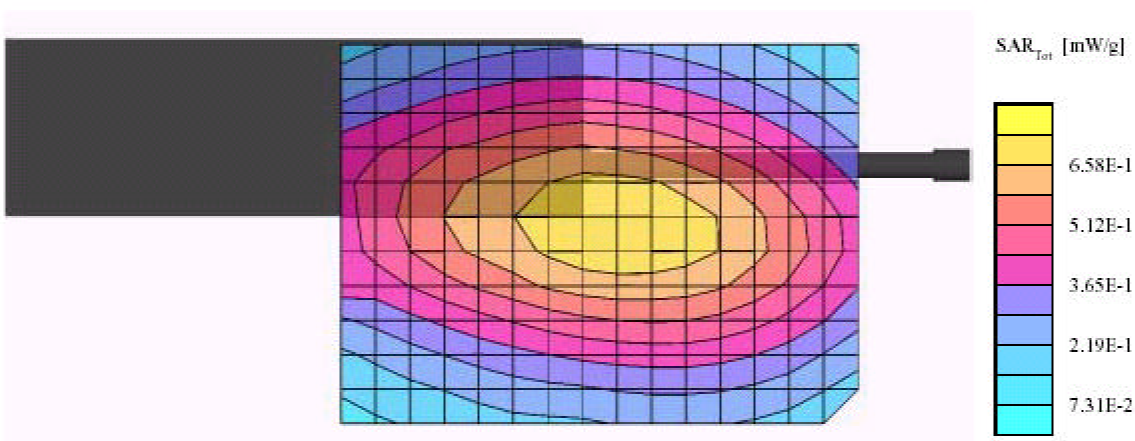
BK Radio, DPH51 (Leather case with belt clip and microphone touching flat phantom, Middle channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)

SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 162 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.79 mho/m ε_r = 61.1 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.724 mW/g, SAR (10g): 0.546 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.01 dB



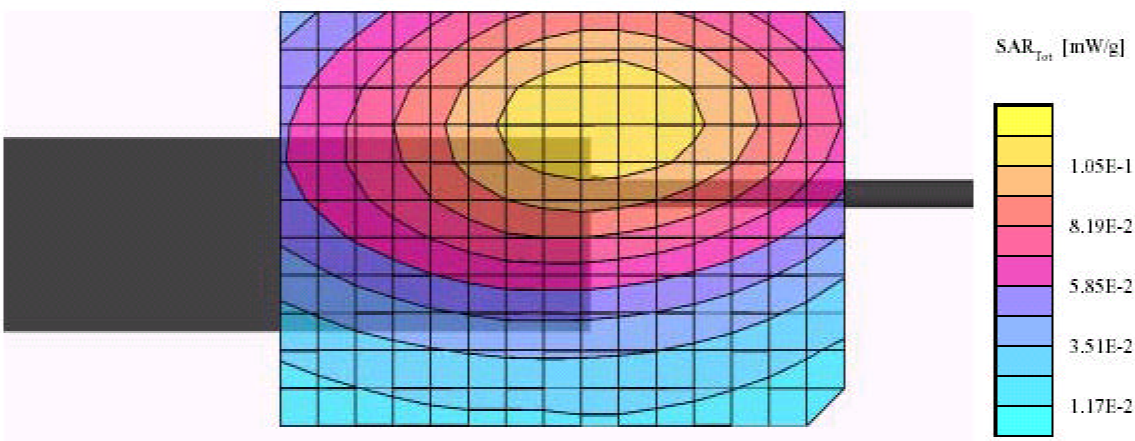
Plot #5

BK Radio, DPH51 (Leather case with belt clip and microphone touching flat phantom, High channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)
SAM Phantom; Flat Section; Position: (90°,90°); Frequency: 174 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.79 mho/m ϵ_r = 61.1 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 0.426 mW/g ± 0.43 dB, SAR (10g): 0.314 mW/g ± 0.39 dB, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.00 dB



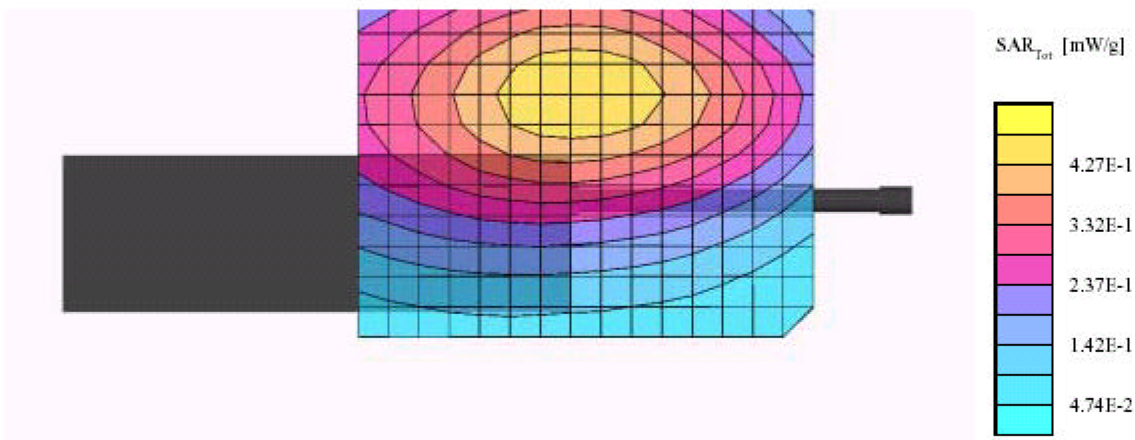
Plot #6

BK Radio, DPH51 (150 MHz head liquid, Face 2.5 cm separation to flat phantom, Low channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)
SAM Phantom; Flat Section; Position: (270°,270°); Frequency: 148 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.78 mho/m ε_r = 51.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.110 mW/g, SAR (10g): 0.0806 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.00 dB



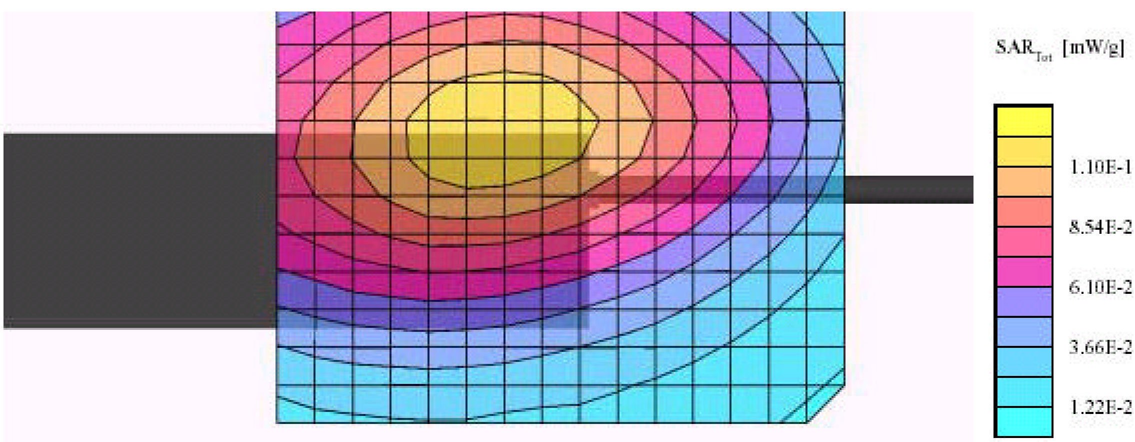
Plot #7

BK Radio, DPH51 (150 MHz head liquid, Face 2.5 cm separation to flat phantom, Middle channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)
SAM Phantom; Flat Section; Position: (270°,270°); Frequency: 162 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.78 mho/m ε_r = 51.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.439 mW/g, SAR (10g): 0.317 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: 0.01 dB



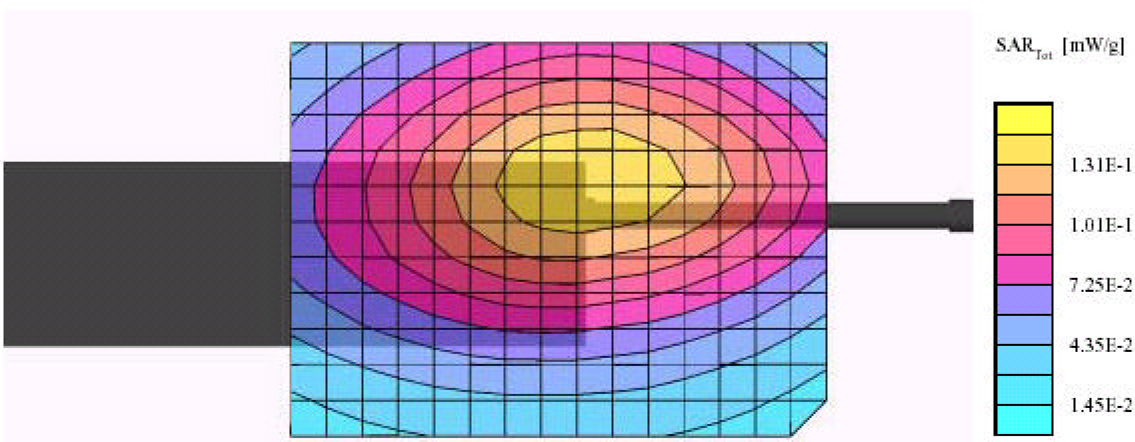
Plot #8

BK Radio, DPH51 (150 MHz head liquid, Face 2.5 cm separation to flat phantom, High channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)
SAM Phantom; Flat Section; Position: (270°,270°); Frequency: 174 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.78 mho/m ε_r = 51.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.115 mW/g, SAR (10g): 0.0841 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.00 dB



Plot #9

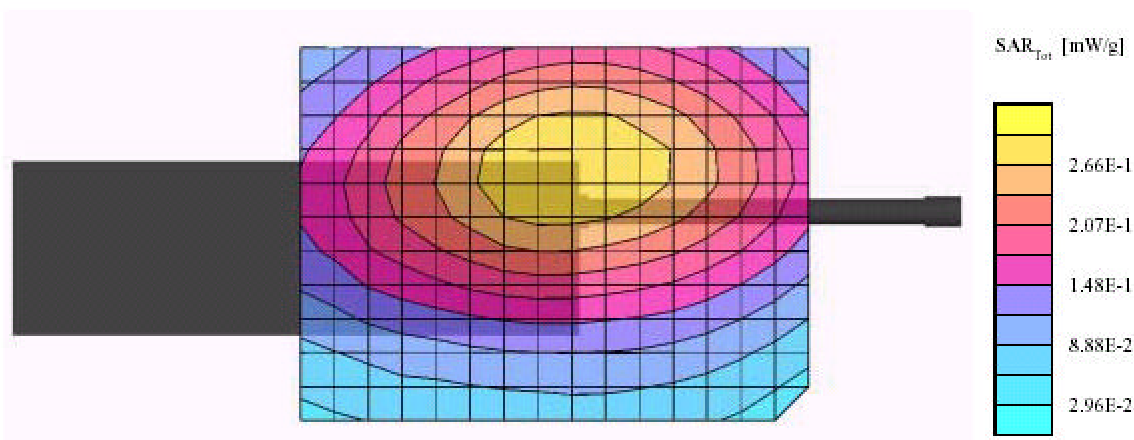
BK Radio, DPH51 (150 MHz head liquid, Face 2.5 cm separation to flat phantom with earphone, Low channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)
SAM Phantom; Flat Section; Position: (270°,270°); Frequency: 148 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.78 mho/m ε_r = 51.9 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 0.136 mW/g ± 0.07 dB, SAR (10g): 0.0989 mW/g ± 0.06 dB, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.00 dB



Plot #10

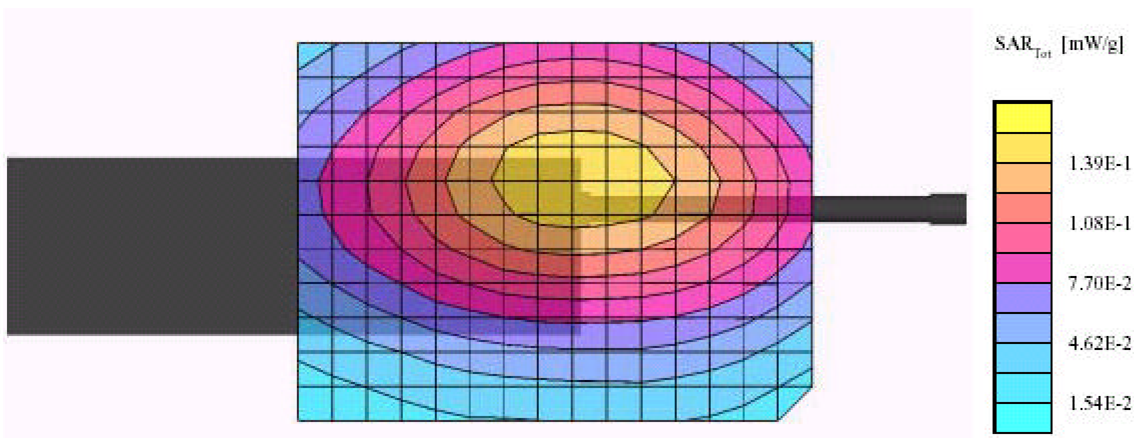
BK Radio, DPH51 (150 MHz head liquid, Face 2.5 cm separation to flat phantom with earphone, Middle channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)

SAM Phantom; Flat Section; Position: (270°,270°); Frequency: 162 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.78 mho/m ε_r = 51.9 ρ = 1.00 g/cm³
Cubes (2): SAR (1g): 0.277 mW/g ± 0.02 dB, SAR (10g): 0.202 mW/g ± 0.01 dB, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.04 dB



Plot #11

BK Radio, DPH51 (150 MHz head liquid, Face 2.5 cm separation to flat phantom with earphone, High channel, Ambient Temp = 23 Deg C, Liquid Temp = 22 Deg C, 4/29/2003)
SAM Phantom; Flat Section; Position: (270°,270°); Frequency: 174 MHz
Probe: ET3DV6 - SN1604; ConvF(8.80,8.80,8.80); Crest factor: 1.0; 150: σ = 0.78 mho/m ϵ_r = 51.9 ρ = 1.00 g/cm³
Cube 5x5x7: SAR (1g): 0.145 mW/g, SAR (10g): 0.105 mW/g, (Worst-case extrapolation)
Coarse: Dx = 12.0, Dy = 12.0, Dz = 10.0
Powerdrift: -0.05 dB



Plot #12