

SAR EVALUATION RESULTS WITH EXTERNAL POWER SUPPLY

Test Type	Freq. (MHz)	Chan.	Test Mode	DUT Type	Antenna Type	Body-Worn Accessories	Power Source	Separation Distance to Planar Phantom (cm)	Cond. Power Before Test (dBm)	Measured SAR 1g (W/kg)		SAR Drift During Test (dB)	Scaled SAR 1g (W/kg)	
										Duty Cycle			Duty Cycle	
										100%	50%		100%	50%
Face	480	Mid	CW	Radio	Whip	—	Ext. Power (to NiMH)	2.5	36.57	2.22	1.11	-0.487	2.48	1.24
Body	480	Mid	CW	SMA	Whip	Lapel-Clip	Ext. Power (to NiMH)	1.2	36.75	8.48	4.24	-0.658	9.87	4.93

ANSI / IEEE C95.1 1999 - SAFETY LIMIT
BRAIN / BODY: 8.0 W/kg (averaged over 1 gram)
Spatial Peak - Controlled Exposure / Occupational

Test Date(s)	February 11, 2005			February 11, 2005			Measured Fluid Type	Brain	Body	Unit
Dielectric Constant ϵ_r	450 MHz Brain			450 MHz Body			Relative Humidity	30	30	%
	IEEE Target		Measured	IEEE Target		Measured	Atmospheric Pressure	102.2	101.6	kPa
	43.5	$\pm 5\%$	42.2	56.7	$\pm 5\%$	56.6	Ambient Temperature	21.8	23.8	°C
Conductivity σ (mho/m)	450 MHz Brain			450 MHz Body			Fluid Temperature	21.4	22.3	°C
	IEEE Target		Measured	IEEE Target		Measured	Fluid Depth	≥ 15	≥ 15	cm
	0.87	$\pm 5\%$	0.84	0.94	$\pm 5\%$	0.91	ρ (Kg/m ³)	1000		

Note(s):

- To determine conservative SAR results from the original evaluations, the above tests were performed in the worst-case power drift configurations previously tested by using an external power supply connected to the NiMH battery terminals with a ferrite dampener on the power leads. SAR-versus-Time power drift evaluations were also performed with the external power supply. See page(s) below for the SAR test plots and SAR-versus-Time power drift evaluation data.
- The power drifts measured by the DASY4 system for the duration of the SAR evaluations were added to the measured SAR levels to report scaled SAR levels as shown in the above table.
- The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluation. The temperatures reported were consistent for all measurement periods.
- The dielectric parameters of the simulated tissue mixtures were measured prior to the evaluation using an HP 85070C Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix E for printout of measured fluid dielectric parameters).
- The SAR evaluations were performed within 24 hours of the system performance check.
- Abbreviation(s): SMA - Speaker-Microphone with Antenna.

SYSTEM PERFORMANCE CHECK

Test Date	450MHz Equiv. Tissue	SAR 1g (W/kg)		Dielectric Constant ϵ_r		Conductivity σ (mho/m)		ρ (Kg/m ³)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		IEEE Target	Measured	IEEE Target	Measured	IEEE Target	Measured						
02/11/05	Brain	1.23 ($\pm 10\%$)	1.23	43.5 $\pm 5\%$	42.2	0.87 $\pm 5\%$	0.84	1000	21.8	21.4	≥ 15	30	102.2

Note(s):

- The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the system performance check. The temperatures reported in the table above were consistent for all measurement periods.

Date Tested: 02/11/05

Face-Held SAR - Radio Transceiver - External Power Supply to Radio Battery Terminals

DUT: E.F. Johnson Model: 4140; Type: Portable FM UHF PTT Radio Transceiver; Serial: n/a (Identical Prototype)

Ambient Temp: 21.8 °C; Fluid Temp: 21.4 °C; Barometric Pressure: 102.2 kPa; Humidity: 30%

Communication System: FM UHF

Frequency: 480 MHz; Duty Cycle: 1:1

RF Output Power: 36.57 dBm (Conducted)

8.0V External Power Supply to NiMH Battery Terminals

Medium: HSL450 ($\sigma = 0.84$ mho/m; $\epsilon_r = 42.2$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 06/07/2004
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

Face-Held - 2.5 cm Separation Distance - Mid Channel/Area Scan (8x22x1):

Measurement grid: dx=15mm, dy=15mm

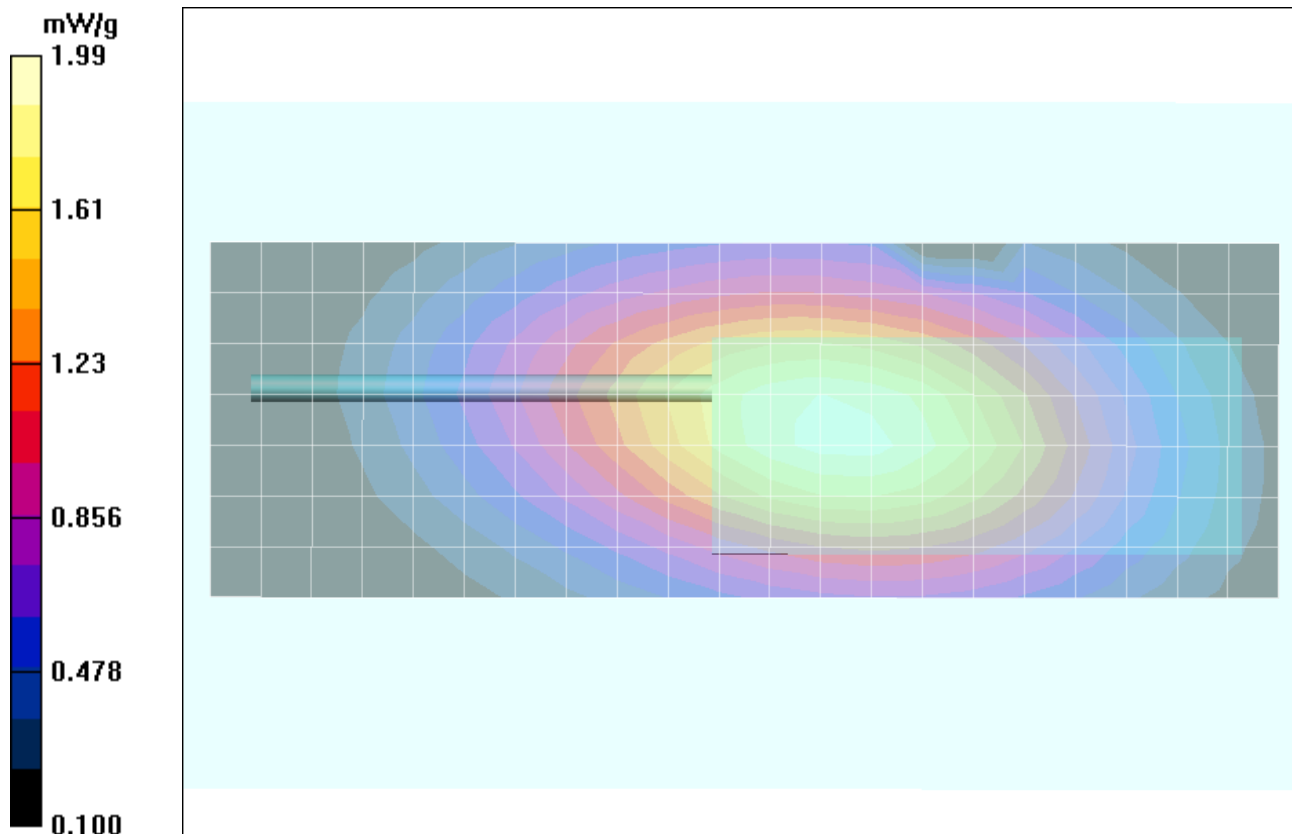
Face-Held - 2.5 cm Separation Distance - Mid Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

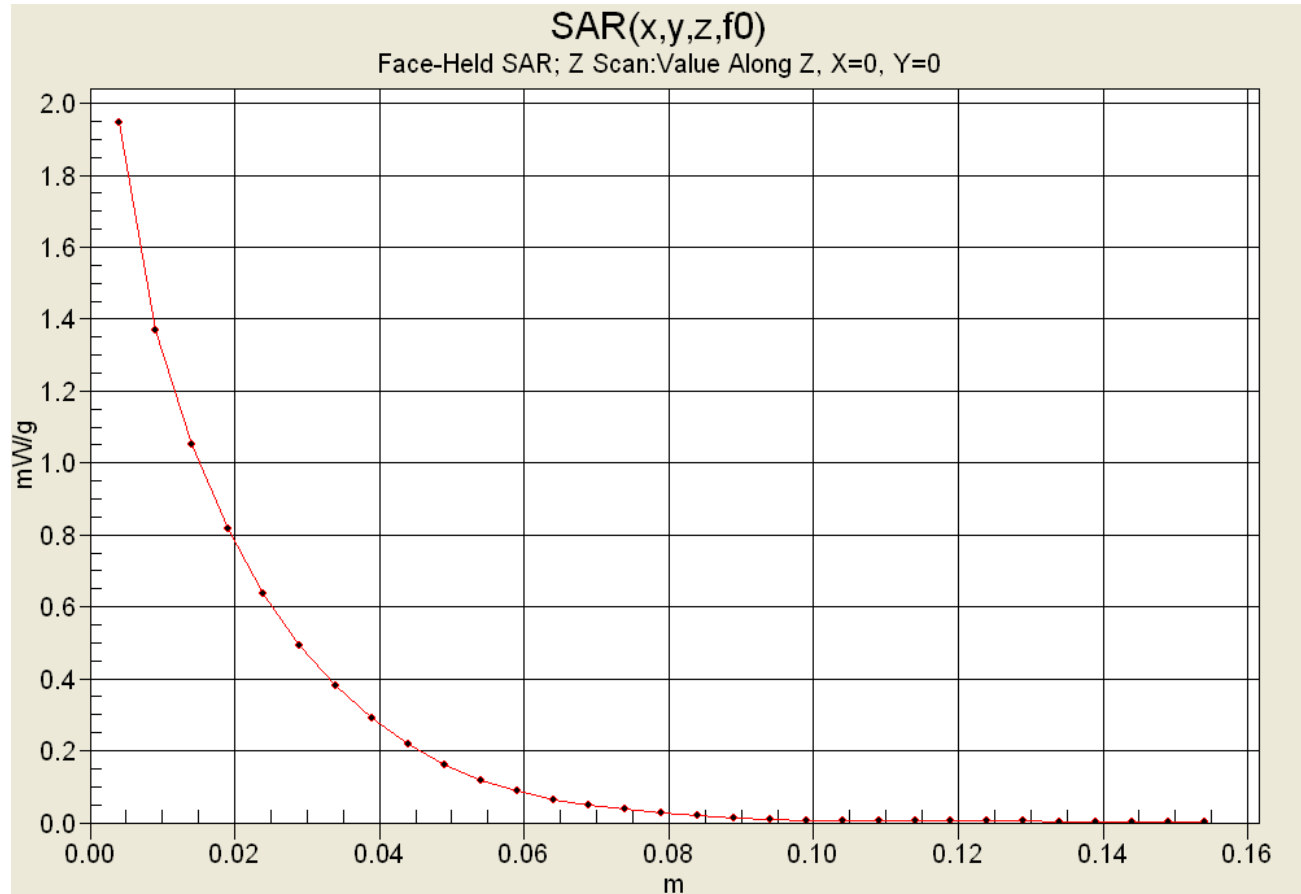
Reference Value = 47.5 V/m; Power Drift = -0.487 dB

Peak SAR (extrapolated) = 5.39 W/kg

SAR(1 g) = 2.22 mW/g; SAR(10 g) = 1.44 mW/g



Z-Axis Scan

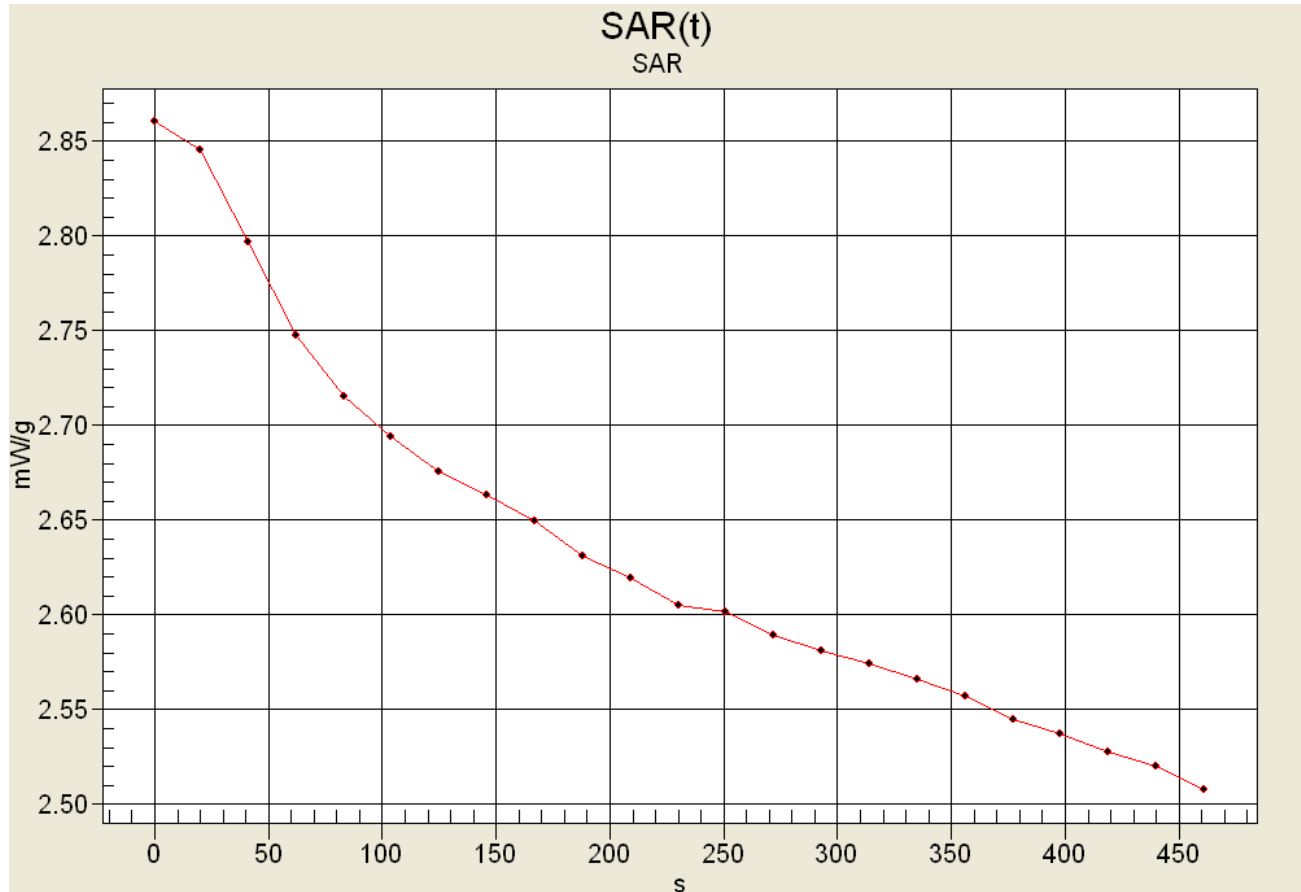


SAR-versus-Time Power Drift Evaluation

Face-Held Configuration

8V External Power Supply to NiMH Battery Terminals

Mid Channel - 480 MHz



Start SAR: 2.86042 mW/g

End SAR: 2.50793 mW/g (-0.571 dB)

SAR after 340s: 2.5658 mW/g (-0.472 dB)

(340s = Zoom Scan Duration)

Date Tested: 02/11/05

Body-Worn SAR - Speaker-Microphone with Antenna - External Power Supply to Battery Terminals

DUT: E.F. Johnson Model: 4140; Type: Portable FM PTT Speaker-Microphone with Antenna & Lapel-Clip; P/N: 589-0015-058

Ambient Temp: 23.8 °C; Fluid Temp: 22.3 °C; Barometric Pressure: 101.6 kPa; Humidity: 30%

Communication System: FM UHF

Frequency: 480 MHz; Duty Cycle: 1:1

RF Output Power: 36.75 dBm (Conducted)

8.0V External Power Supply to NiMH Battery Terminals

Medium: M450 ($\sigma = 0.91$ mho/m; $\epsilon_r = 56.6$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(7.6, 7.6, 7.6); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 06/07/2004
- Phantom: Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

Body-Worn - 1.2 cm Lapel-Clip Separation Distance - Mid Channel/Area Scan (8x17x1):

Measurement grid: dx=15mm, dy=15mm

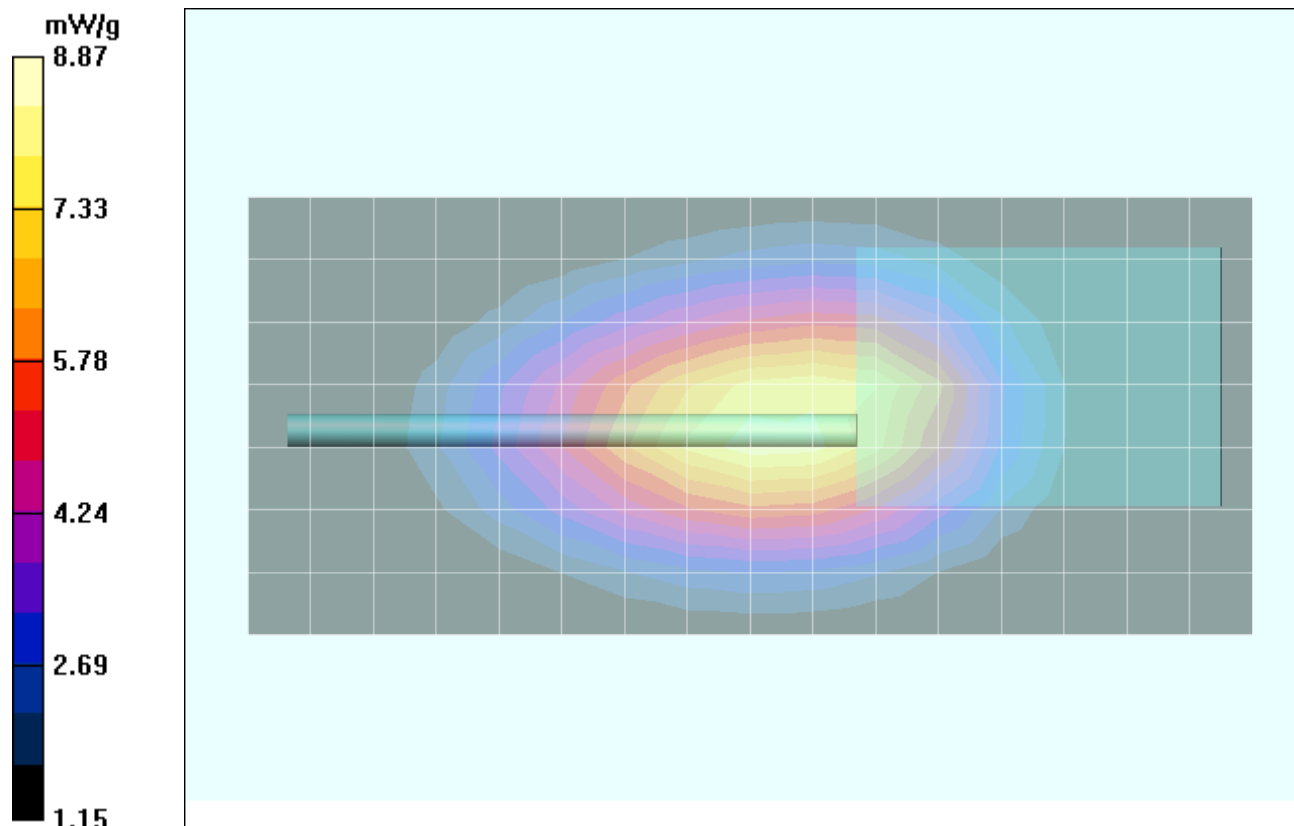
Body-Worn - 1.2 cm Lapel-Clip Separation Distance - Mid Channel/Zoom Scan (5x5x7)/Cube 0:

Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

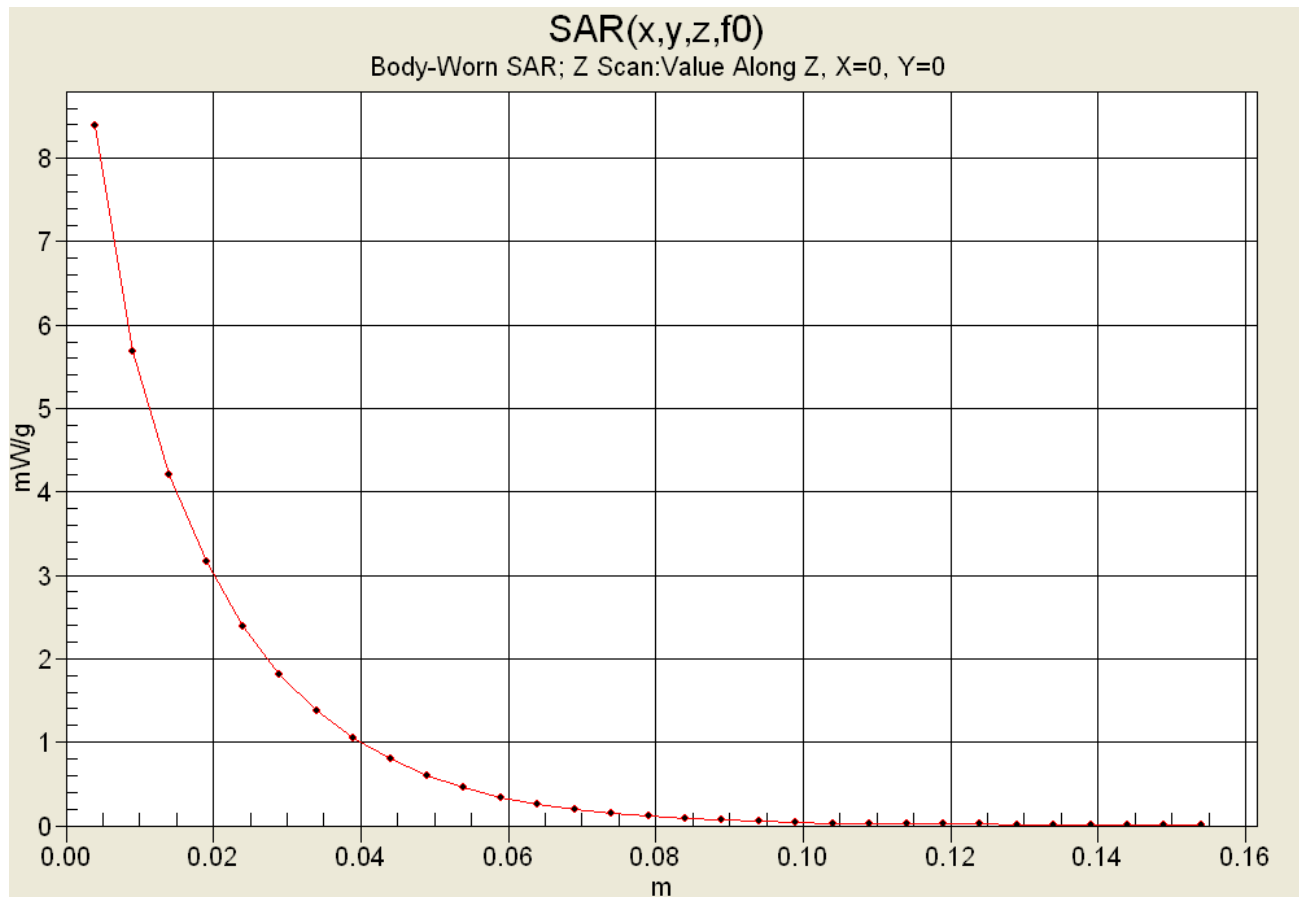
Reference Value = 97.3 V/m; Power Drift = -0.658 dB

Peak SAR (extrapolated) = 13.5 W/kg

SAR(1 g) = 8.48 mW/g; SAR(10 g) = 5.92 mW/g



Z-Axis Scan

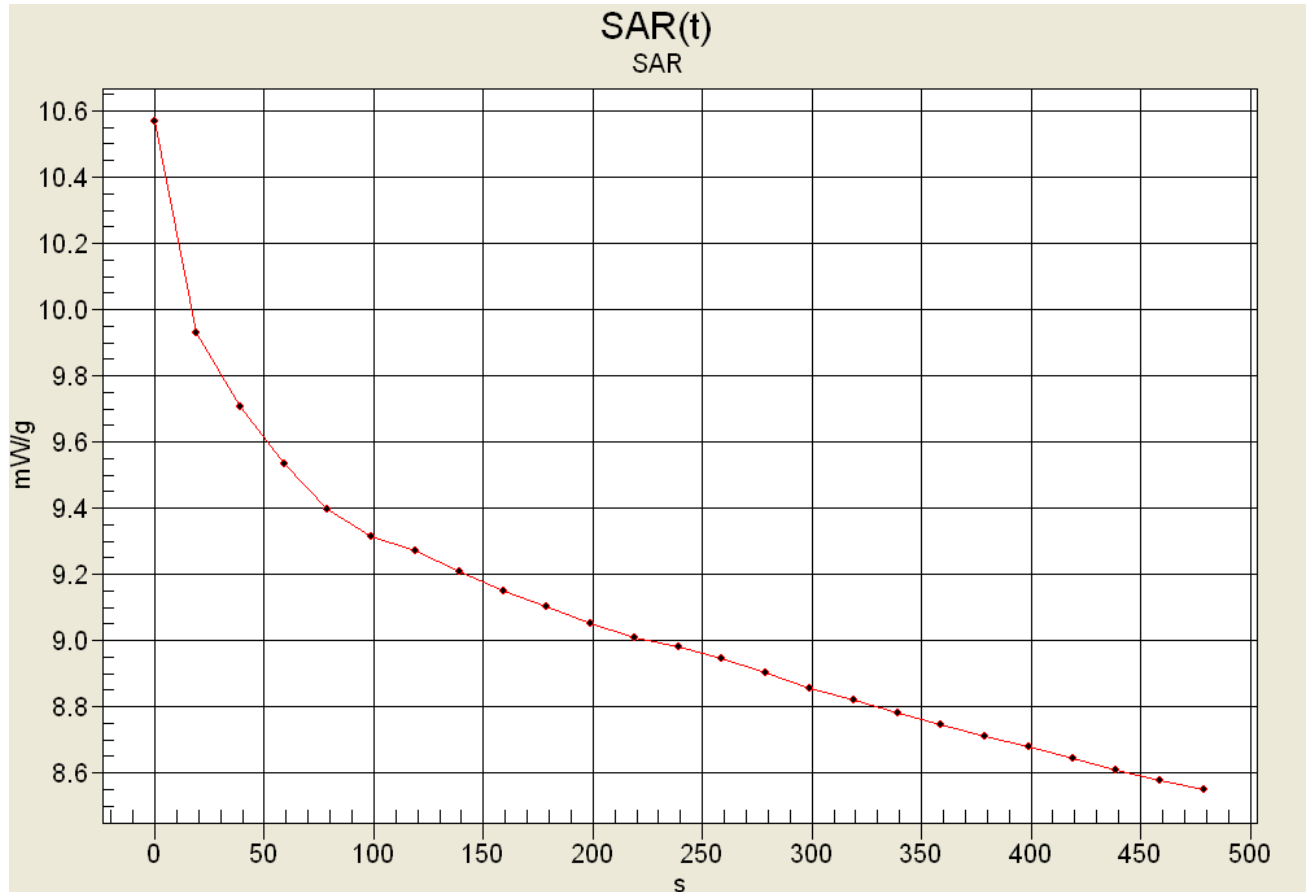


SAR-versus-Time Power Drift Evaluation

Body-Worn Configuration with Speaker-Microphone Antenna

8V External Power Supply to NiMH Battery Terminals

Mid Channel - 480 MHz



Start SAR: 10.554 mW/g

End SAR: 8.5372 mW/g (-0.921 dB)

SAR after 340s: 8.76686 mW/g (-0.805 dB)

(340s = Zoom Scan Duration)

Date Tested: 02/11/05

System Performance Check - 450 MHz Dipole

DUT: Dipole 450 MHz; Model: D450V2; Type: System Performance Check; Serial: 136; Calibrated: 11/04/2004

Ambient Temp: 21.8 °C; Fluid Temp: 21.4 °C; Barometric Pressure: 102.2 kPa; Humidity: 30%

Communication System: CW

Forward Conducted Power: 250 mW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 ($\sigma = 0.84$ mho/m; $\epsilon_r = 42.2$; $\rho = 1000$ kg/m³)

- Probe: ET3DV6 - SN1387; ConvF(7.5, 7.5, 7.5); Calibrated: 18/03/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 06/07/2004
- Phantom: Validation Planar; Type: Plexiglas; Serial: 137
- Measurement SW: DASY4, V4.3 Build 22; Postprocessing SW: SEMCAD, V1.8 Build 127

450 MHz Dipole - System Performance Check/Area Scan (6x11x1):

Measurement grid: dx=15mm, dy=15mm

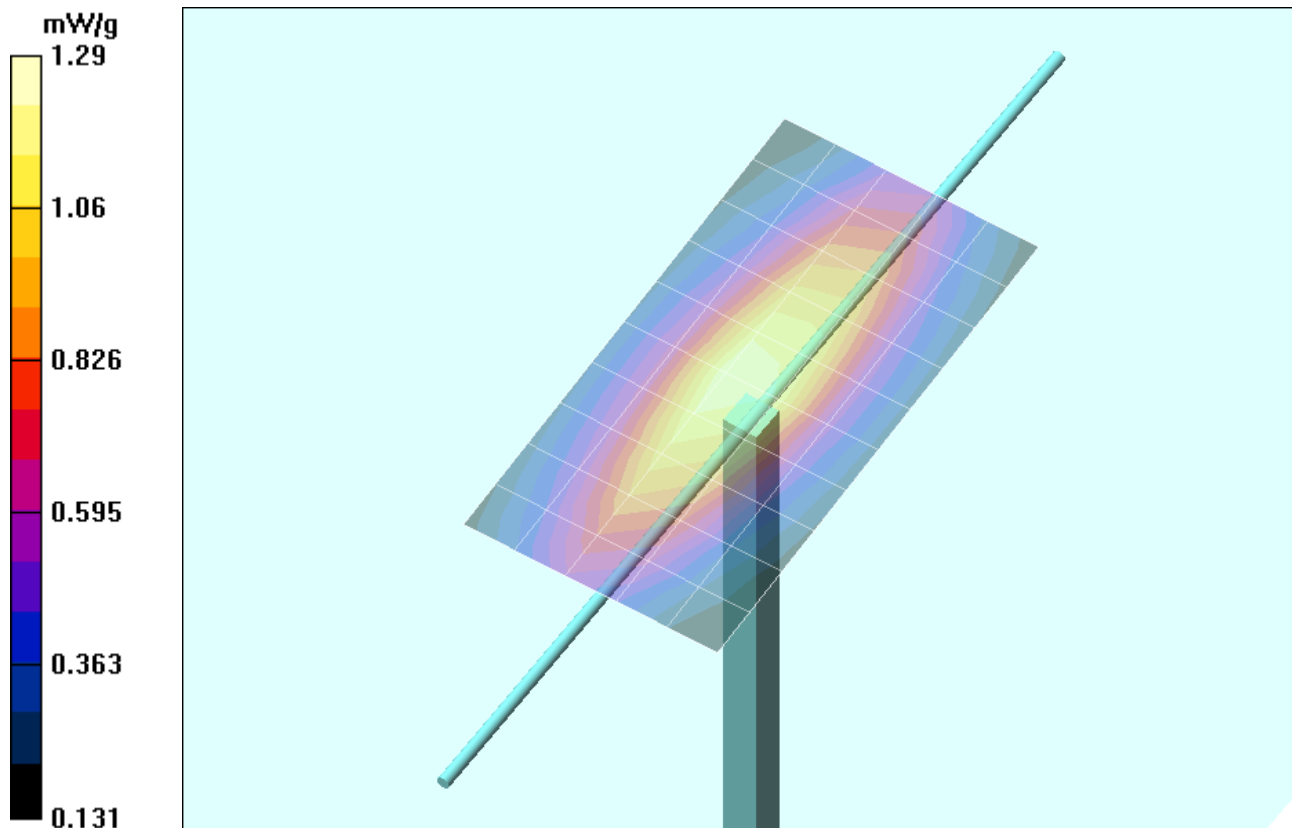
450 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

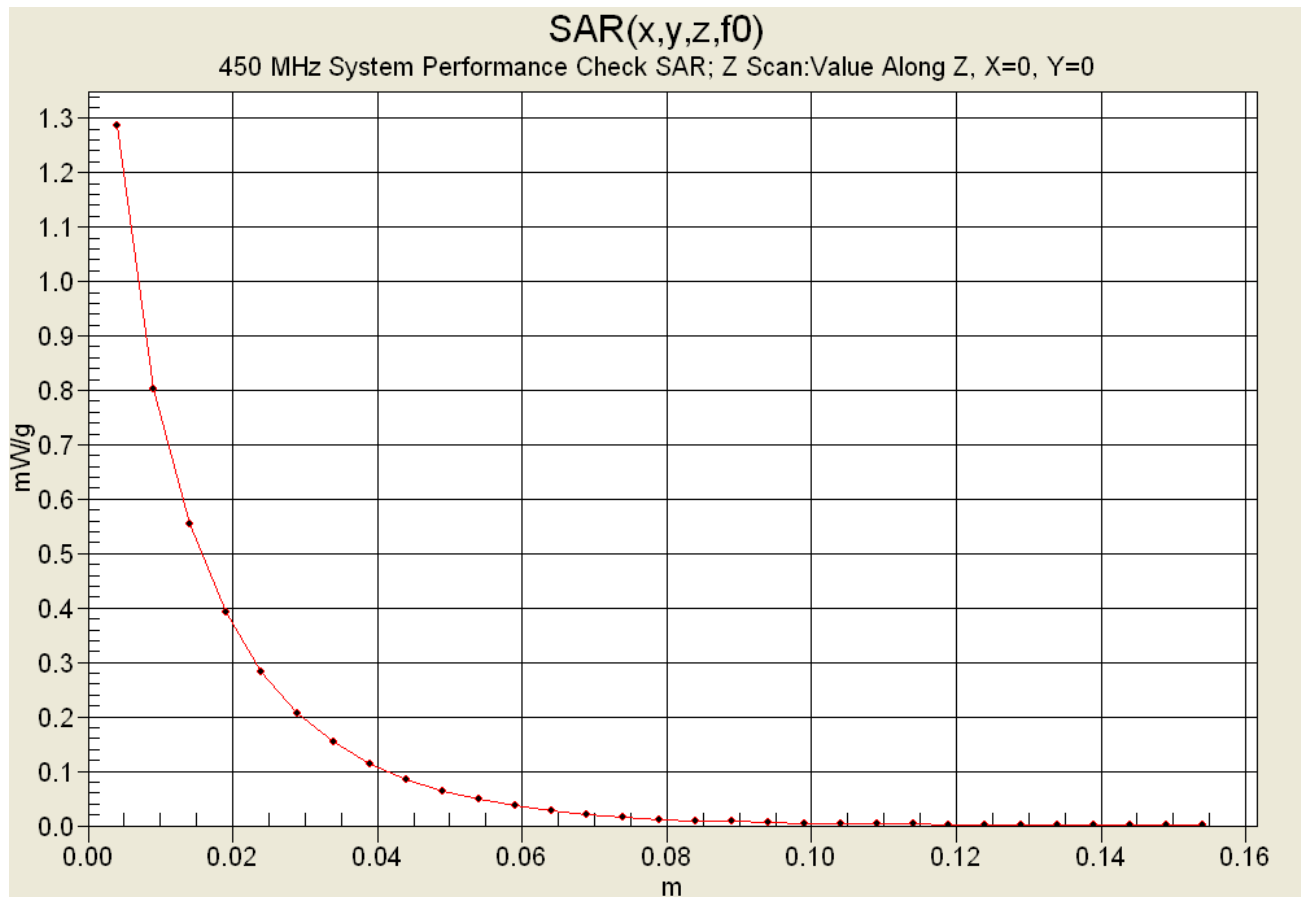
Reference Value = 39.4 V/m; Power Drift = -0.1 dB

Peak SAR (extrapolated) = 2.13 W/kg

SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.792 mW/g



Z-Axis Scan



450 MHz System Performance Check & DUT Evaluation (Face)

Measured Fluid Dielectric Parameters (Brain)

February 11, 2005

Frequency	e'	e''
350.000000 MHz	44.6871	38.9261
360.000000 MHz	44.3243	38.3421
370.000000 MHz	44.1458	37.6551
380.000000 MHz	43.8749	37.1248
390.000000 MHz	43.6523	36.5410
400.000000 MHz	43.4224	35.9873
410.000000 MHz	43.2058	35.4588
420.000000 MHz	42.8844	34.9704
430.000000 MHz	42.6107	34.4503
440.000000 MHz	42.3942	34.0509
450.000000 MHz	42.1514	33.6643
460.000000 MHz	41.9479	33.2893
470.000000 MHz	41.7346	32.9141
480.000000 MHz	41.5079	32.5131
490.000000 MHz	41.3141	32.1583
500.000000 MHz	41.0882	31.8741
510.000000 MHz	40.9378	31.4895
520.000000 MHz	40.7256	31.1953
530.000000 MHz	40.5305	30.8618
540.000000 MHz	40.4217	30.4866
550.000000 MHz	40.1716	30.2192

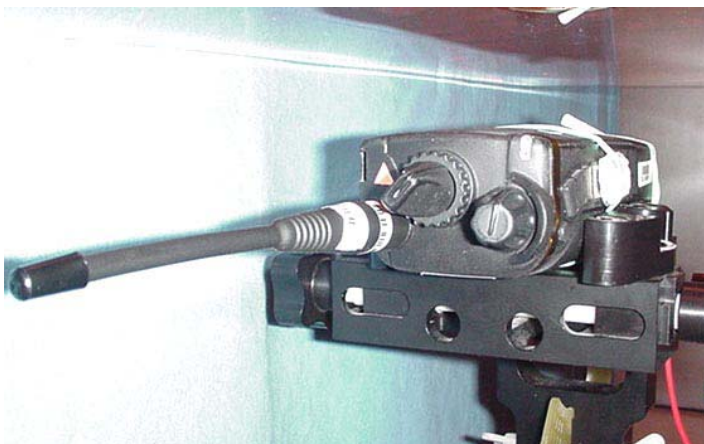
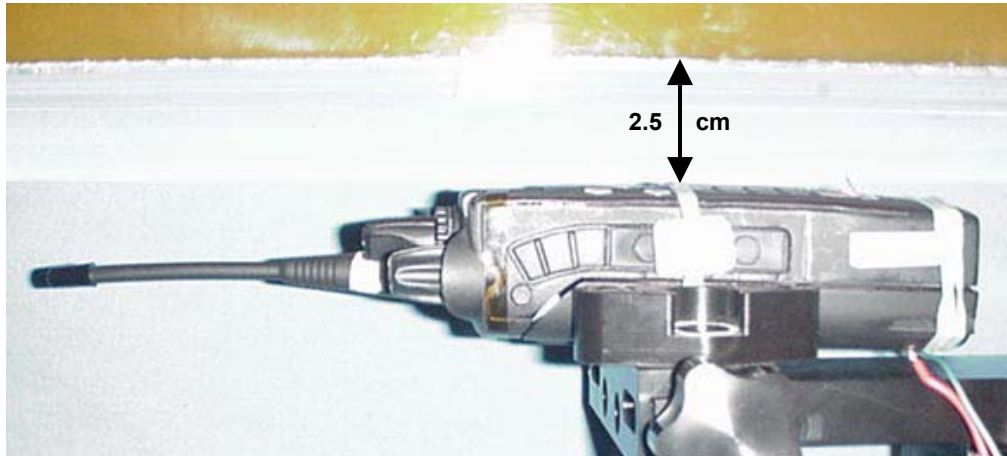
450 MHz DUT Evaluation (Body)


Measured Fluid Dielectric Parameters (Muscle)

February 11, 2005

Frequency	e'	e''
350.000000 MHz	58.3207	42.6169
360.000000 MHz	58.0903	41.9169
370.000000 MHz	57.9983	41.1609
380.000000 MHz	57.8319	40.4759
390.000000 MHz	57.6642	39.7474
400.000000 MHz	57.4161	39.1311
410.000000 MHz	57.1957	38.4971
420.000000 MHz	57.0855	37.9725
430.000000 MHz	56.8827	37.4081
440.000000 MHz	56.7423	36.8750
450.000000 MHz	56.5558	36.3728
460.000000 MHz	56.4434	35.9695
470.000000 MHz	56.2877	35.5538
480.000000 MHz	56.1414	35.1520
490.000000 MHz	55.9832	34.7501
500.000000 MHz	55.8174	34.3649
510.000000 MHz	55.7056	33.9645
520.000000 MHz	55.5194	33.6620
530.000000 MHz	55.4030	33.2718
540.000000 MHz	55.2739	32.8812
550.000000 MHz	55.1621	32.5792

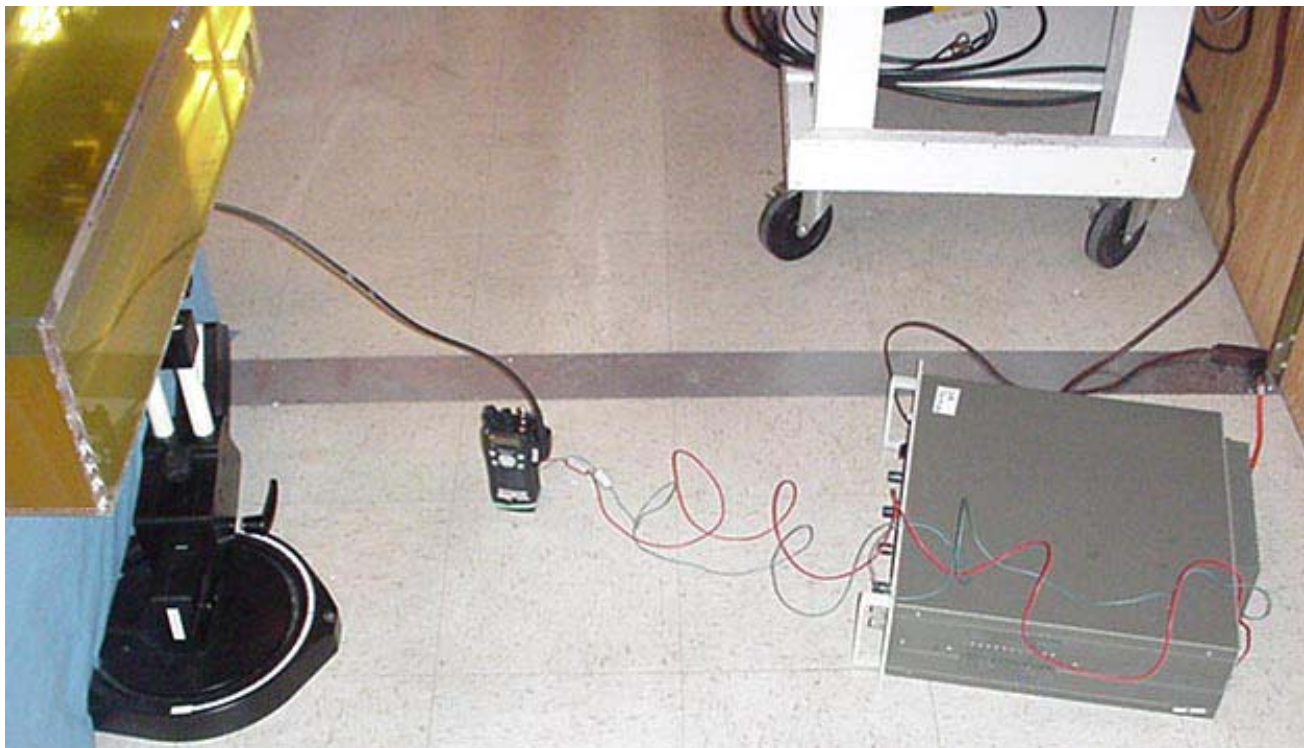
FACE-HELD SAR TEST SETUP PHOTOGRAPHS
Radio Transceiver with External Power Supply connected to NiMH Battery Terminals
2.5 cm Separation Distance from Front of DUT to Planar Phantom




Applicant:	E.F. Johnson Co.	Model(s):	4140	FCC ID:	ATH2424140	IC ID:	933B-2424140
Device Type:	Portable FM UHF PTT Radio Transceiver			Frequency Range:	450 - 512 MHz		
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BODY-WORN SAR TEST SETUP PHOTOGRAPHS

Speaker-Microphone Antenna with External Power Supply connected to NiMH Battery Terminals
1.2 cm Lapel-Clip Separation Distance from Back of DUT to Planar Phantom



Applicant:	E.F. Johnson Co.	Model(s):	4140	FCC ID:	ATH2424140	IC ID:	933B-2424140
Device Type:	Portable FM UHF PTT Radio Transceiver			Frequency Range:	450 - 512 MHz		
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