



M. Flom Associates, Inc. - Global Compliance Center

3356 North San Marcos Place, Suite 107, Chandler, Arizona 85225-7176

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Date: October 6, 2000

Federal Communications Commission
Via Electronic Filing

Attention: Authorization & Evaluation Division

Applicant: E. F. Johnson Company
Equipment: 242-7240
FCC ID: ATH2427240
FCC Rules: 47 CFR 2.1093 (SAR)
Radiofrequency Exposure Evaluation

Gentlemen:

On behalf of the Applicant, enclosed please find the Supplemental Test Data Report and all pertinent documentation, the whole for Environmental Assessment of the referenced equipment as shown.

We trust the same is in order. Should you need any further information, kindly contact the writer who is authorized to act as agent.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'M. Flom', is written over a horizontal line.

Morton Flom, P. Eng.

enclosure(s)
cc: Applicant
MF/cvr



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ENVIRONMENTAL ASSESSMENT

for

PORTABLES

Held-to-Face and/or Belt-Clip Operation

for

FCC ID: FCC ID: ATH2427240

Model: 242-7240

to

FEDERAL COMMUNICATIONS COMMISSION

47 CFR 2.1093 (SAR)

DATE OF REPORT: October 6, 2000

ON THE BEHALF OF THE APPLICANT:

E. F. Johnson Company

AT THE REQUEST OF:

P.O. 154212

E. F. Johnson Company,
299 Johnson Ave.
Waseca, MN 56093-0514

Mailing
Attention of:

(507) 835-6579; FAX: -6666
John Oblak, Director, Radio Products Development
E-mail: JOblak@efjohnson.com
Ann Chester-Jones, Administrator, Engineering Dept
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A handwritten signature in black ink, reading 'M. Flom P. Eng'. The signature is stylized and cursive.

SUPERVISED BY:


Morton Flom, P. Eng.

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Required information per ISO/IEC Guide 25-1990, paragraph 13.2:

- a) TEST REPORT (SUPPLEMENTAL)
- b) Laboratory: M. Flom Associates, Inc.
(FCC: 31040/SIT) 3356 N. San Marcos Place, Suite 107
(Canada: IC 2044) Chandler, AZ 85225
- c) Report Number: d00a0004
- d) Client: E. F. Johnson Company,
299 Johnson Ave.
Waseca, MN 56093-0514
- e) Identification: 242-7240
FCC ID: ATH2427240
Description: UHF FM Handheld Transceiver
- f) EUT Condition: Not required unless specified in individual tests.
- g) Report Date: October 6, 2000
EUT Received: September 1, 2000
- h, j, k): As indicated in individual tests.
- i) Sampling method: No sampling procedure used.
- l) Uncertainty: In accordance with MFA internal quality manual.
- m) Supervised by: 
Morton Flom, P. Eng.
- n) Results: The results presented in this report relate only to the item tested.
- o) Reproduction: This report must not be reproduced, except in full, without written permission from this laboratory.

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IDENTIFICATION OF THE EQUIPMENT UNDER TEST (EUT)NAME AND ADDRESS OF APPLICANT:

E. F. Johnson Company
299 Johnson Ave.
Waseca, MN 56093-0514

MANUFACTURER:


Applicant

FREQUENCY RANGE, MHz: 430 to 470WATTS: $\frac{1}{4}$ ANTENNA TYPE: $\frac{1}{4}$ WaveSUPPLIED: YesINTEGRAL: NoGAIN: 3 dbMODULATION: F3E

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M. Flom Associates, Inc. is accredited by the American Association for Laboratory Accreditation (A2LA) as shown in the scope below.



**THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION**

ACCREDITED LABORATORY

A2LA has accredited


M. FLOM ASSOCIATES, INC.
Chandler, AZ

for technical competence in the field of

Electrical (EMC) Testing


The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC Guide 25-1990 "General Requirements for the Competence of Calibration and Testing Laboratories" (equivalent to relevant requirements of the ISO 9000 series of standards) and any additional program requirements in the identified field of testing.

Presented this 24th day of November, 1998.



Peter Nijzen
President
For the Accreditation Council
Certificate Number 1008.01
Valid to December 31, 2000

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical (EMC) Scope of Accreditation



American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC GUIDE 25-1990 AND EN 45001

M. FLOM ASSOCIATES, INC.
Electronic Testing Laboratory
3356 North San Marcos Place, Suite 107
Chandler, AZ 85225
Morton Flom Phone: 480 926 3100

ELECTRICAL (EMC)

Valid to: December 31, 2000 Certificate Number: 1008-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following electromagnetic compatibility tests:

Tests	Standard(s)
RF Emissions	FCC Part 15 (Subparts B and C) using ANSI C63.4-1992; CISPR 11; CISPR 13; CISPR 14; CISPR 22; EN 55011; EN 55013; EN 55014; EN 55022; EN 50081-1; EN 50081-2; FCC Part 18; ICES-003; AS/NZS 1044; AS/NZS 1053; AS/NZS 3548; AS/NZS 4251.1; CNS 13438
RF Immunity	EN 50082-1; EN 50082-2; AS/NZS 4251.1
Radiated Susceptibility	EN 61000-4-3; ENV 50140; ENV 50204; IEC 1000-4-3; IEC 801-3
ESD	EN 61000-4-2; IEC 1000-4-2; IEC 801-2
EFT	EN 61000-4-4; IEC 1000-4-4; IEC 801-4
Surge	EN 61000-4-5; ENV 50142; IEC 1000-4-5; IEC 801-5
47 CFR (FCC)	2, 21, 22, 23, 24, 74, 80, 87, 90, 95, 97

Revised 2/2/2000

Peter Nijzen

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8370 • Phone: 301 644 3248 • Fax: 301 662 2974

"This laboratory is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this report have been determined in accordance with the laboratory's terms of accreditation unless stated otherwise in the report."

Should this report contain any data for tests for which we are not accredited, or which have been undertaken by a subcontractor that is not A2LA accredited, such data would not covered by this laboratory's A2LA accreditation.

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R.F. Power Output

Conducted = Yes

Radiated = No

<u>Frequency, MHz</u>	<u>Watts, Conducted</u>
430.0125	4.027
450.0125	4.045
469.9875	3.944

After each measurement: 1) Checked Battery Voltage
2) Checked Power Output

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Probe Calibration

Probe	Narda 8021B
Calibrated	June 2000
TEM Cell	Fischer Model JM2 TEM
Cross-Sectional Dimensions	15.2 x 9.9 cm
Flux Density	1 milliwatt/cm ²
Feed Power, (free space field)	150.5 milliwatts

At each frequency of interest, the probe is subjected to this free space field. The combined output of the 3 orthogonal outputs is measured.

<u>MHz</u>	<u>Feed Power, mW</u>	<u>Calibration, mV</u>
430.0125	150.5	5.50
450.0125	150.5	5.49
469.9875	150.5	5.00

Field Strength of free space = 0.661 V/cm

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True Induced Voltage

<u>Test Data, MHz</u>	<u>Measured, millivolts</u>	<u>True Induced, Voltage V</u>
430.0125	8.89	1.061
450.0125	7.61	0.916
469.9875	8.87	1.173

SAMPLE CALCULATION:

For 469.9875 MHz

measured = 8.87 mV

calibration = 5.00 mV

$$\begin{aligned}\text{true induced voltage} &= 8.87 \times (661/500) \\ &= 1.1726\end{aligned}$$

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Conductivity, σ , Brain Tissue

$$\sigma = e'' \times 8.854 \times 2\pi \times \text{frequency}$$

measured at each frequency with HP85070B network analyzer
and software

<u>MHz</u>	<u>e''</u>	<u>σ, mho/m</u>
430.0125	35.03	0.83799
450.0125	34.54	0.8647
469.9875	34.21	0.8944

DENSITY, ρ

Material density is mass divided by volume.
For tissue material, $\rho = 1.3 \text{ (kg/m}^3\text{)}$ approximately.

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Peak SAR - Brain Tissue

$$\text{SAR} = \frac{|E|^2 \times \sigma}{\rho} \text{ w/kg}$$

<u>MHz</u>	<u>Induced Voltage V</u>	<u>Conductivity mho/m</u>	<u>SAR w/kg</u>
430.0125	1.061	0.838	0.726
450.0125	0.916	0.865	0.558
469.9875	1.173	0.894	0.946

UNCERTAINTY:Probe position = $\pm 1\%$ Volumetric = $\pm 4\%$ Device positioning = $\pm 5\%$ Dist., Probe tip to phantom surface = $1 \pm 0.2 \text{ mm}$ EUT Foam cradle - Photo attached - see ANNEX A

Foam spacers, surface to phantom = 2.5 cm

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True Induced Voltage, Muscle

<u>Test Data, MHz</u>	<u>Measured, millivolts</u>	<u>True Induced, Voltage V</u>
430.0125	9.32	1.120
450.0125	9.05	1.0896
469.9875	8.96	1.185

SAMPLE CALCULATION:

For 469.9875 MHz

measured = 8.96 mV

calibration = 5.00 mV

$$\begin{aligned}\text{true induced voltage} &= 8.96 \times (661/500) \\ &= 1.1845\end{aligned}$$

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Conductivity - Muscle Tissue

<u>MHz</u>	<u>e''</u>	<u>Conductivity, (s/m) (mho/m)</u>
430.0125	35.44	0.848
450.0125	34.44	0.862
469.9875	33.68	0.881

Sample Calculation, Conductivity

$$33.68 \times 8.854 \times 2\pi \times 469.9875 = 0.88059$$

Uncertainty = 5%

Peak SAR

$$\text{SAR} = \frac{|E|^2 \times \sigma}{\rho} \text{ w/kg}$$

<u>MHz</u>	<u>Induced Voltage V</u>	<u>Conductivity s/m</u>	<u>SAR w/kg</u>
430.0125	1.120	0.848	0.818
450.0125	1.090	0.862	0.788
469.9875	1.185	0.881	0.952

Addendum:

(THE FOLLOWING WILL BE PLACED IN INSTRUCTION MANUAL)

INSTRUCTIONS TO INSTALLERS & USERS

Minimum Safe Distance: 2.5 cm

Antenna Mounting

Antenna as supplied by manufacturer must not be mounted at a location such that any person or persons can come closer than the above-indicated minimum safe distance to the antenna...i.e. 2.5 cm

Antenna

Substitution

Do not substitute any antenna for the one supplied by manufacturer. You may be exposing person(s) to harmful radiation. Contact supplier or manufacturer for further instructions.

WARNING:

MAINTAIN SEPARATION DISTANCE FROM ANTENNA OF 2.5 cm.

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ANNEX A

DESCRIPTION	PAGE
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Description of Phantom	3
Simulated Tissue	6
Determining SAR	7

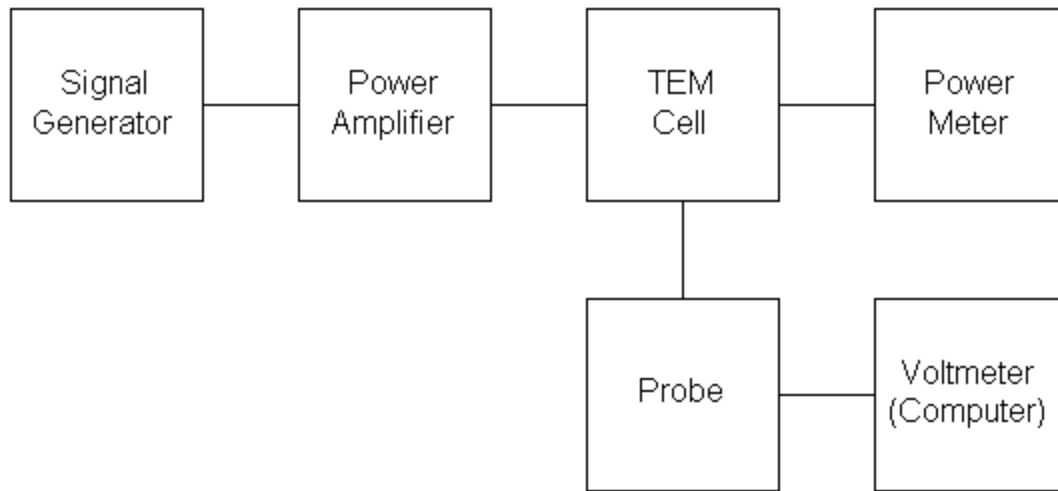
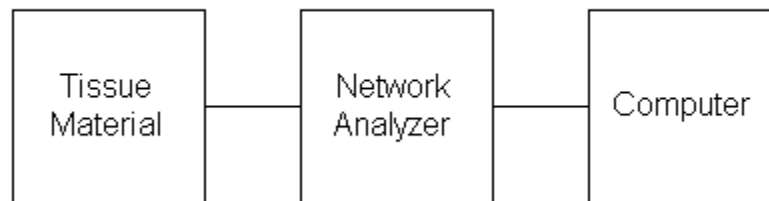
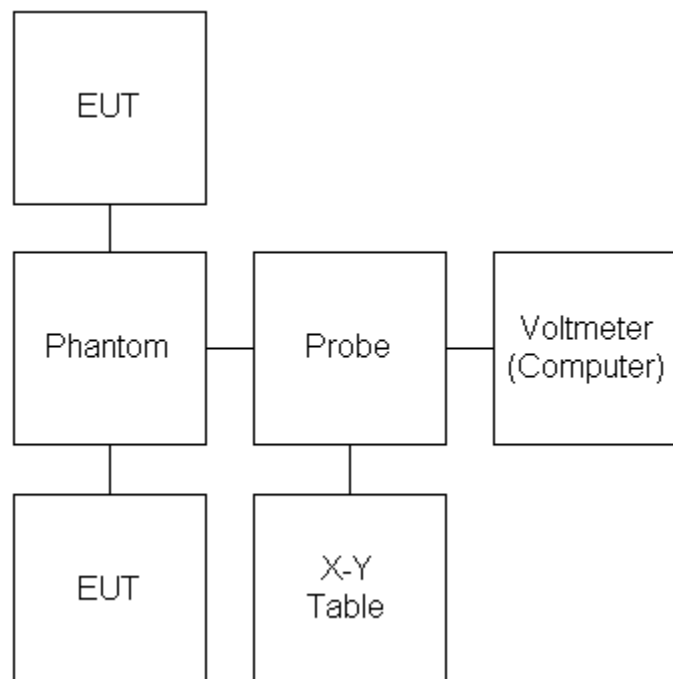
SUPERVISED BY:

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Morton Flom, P. Eng.

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Probe CalibrationMeasurement of ϵ'' Measurement of SAR

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Test Instrumentation

<u>Equipment</u>	<u>Model/Serial No. (as app.)</u>	<u>Cal. Date</u>
1. Signal Generator	HP8640B	Aug. 2000
2. Power Amplifier	Amplifier Research 50W1000A	June 2000
3. Probe	Narda 8021B S/N 04019	June 2000
4. Power Meter	HP436A S/N 2709A16776	June 2000
5. Network Analyzer	HP85070B S/N 103410A00514	June 2000
6. TEM Cell	Fischer JM2TEM S/N 2004	April 2000
7. Phantom	Lab Design Fiber Glass, with 1 cm grid	N/A
8. X-Y Table, Precision	ENCO P/N 201-2826	Not Req'd
9. Computer	Pentium Pro	Not Req'd
10. Precision Thermometer	Guideline 5150 S/N 6485	
11. Foam Cradle	Lab Design, 2.5 cm spacer	N/A

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Description Of Phantom

Material: Fiber Glass

Thickness: 2 mm \pm 0.5 mm

L x W x D, cm: 24.13 x 20.0 x 13.33, \pm 1 mm

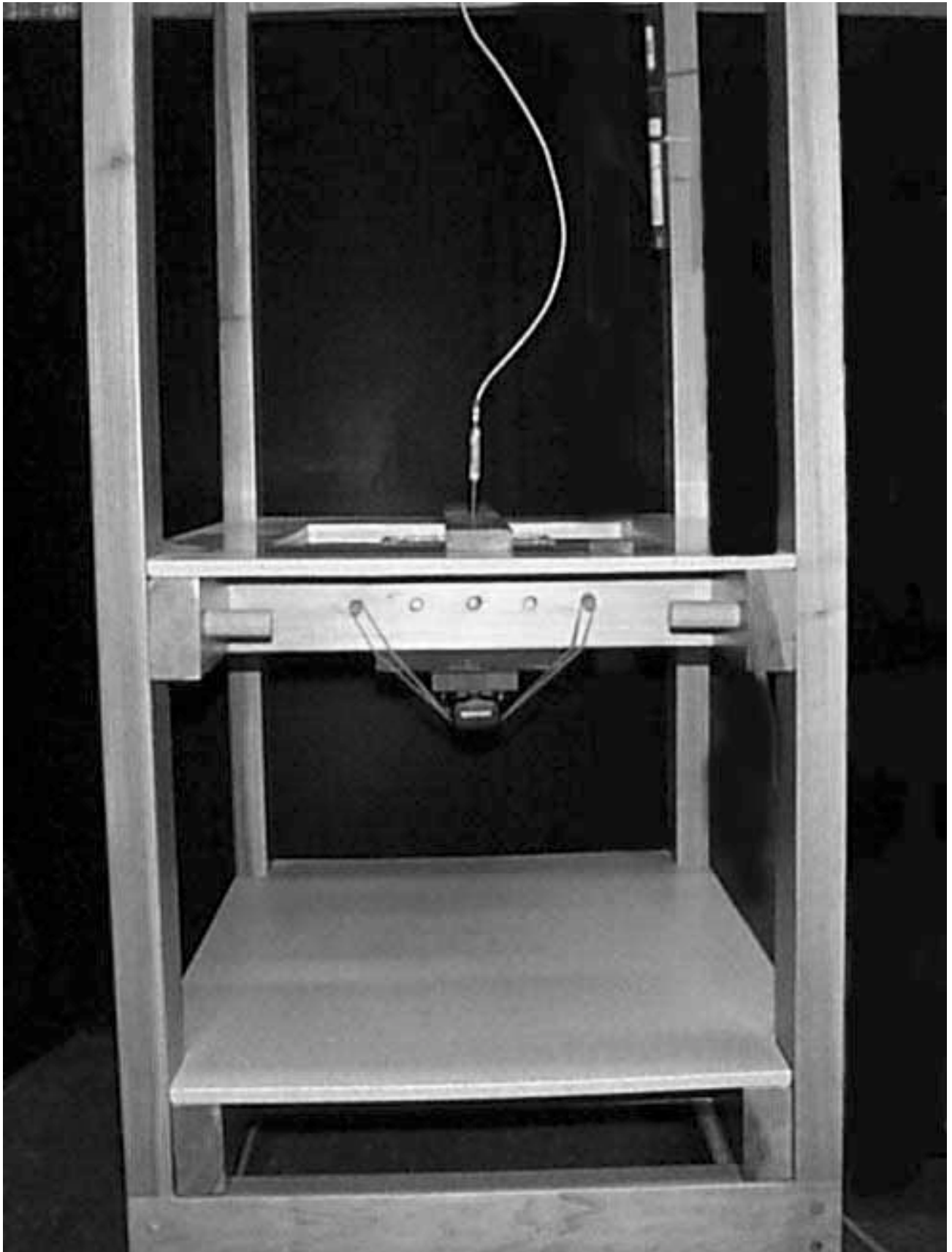
Dielectric Constant: 3.4 kg/m³

Conductivity: 1.2×10^{-4}

Grid of Phantom Bottom: 16 x 16 cm, graduated 1 cm squares

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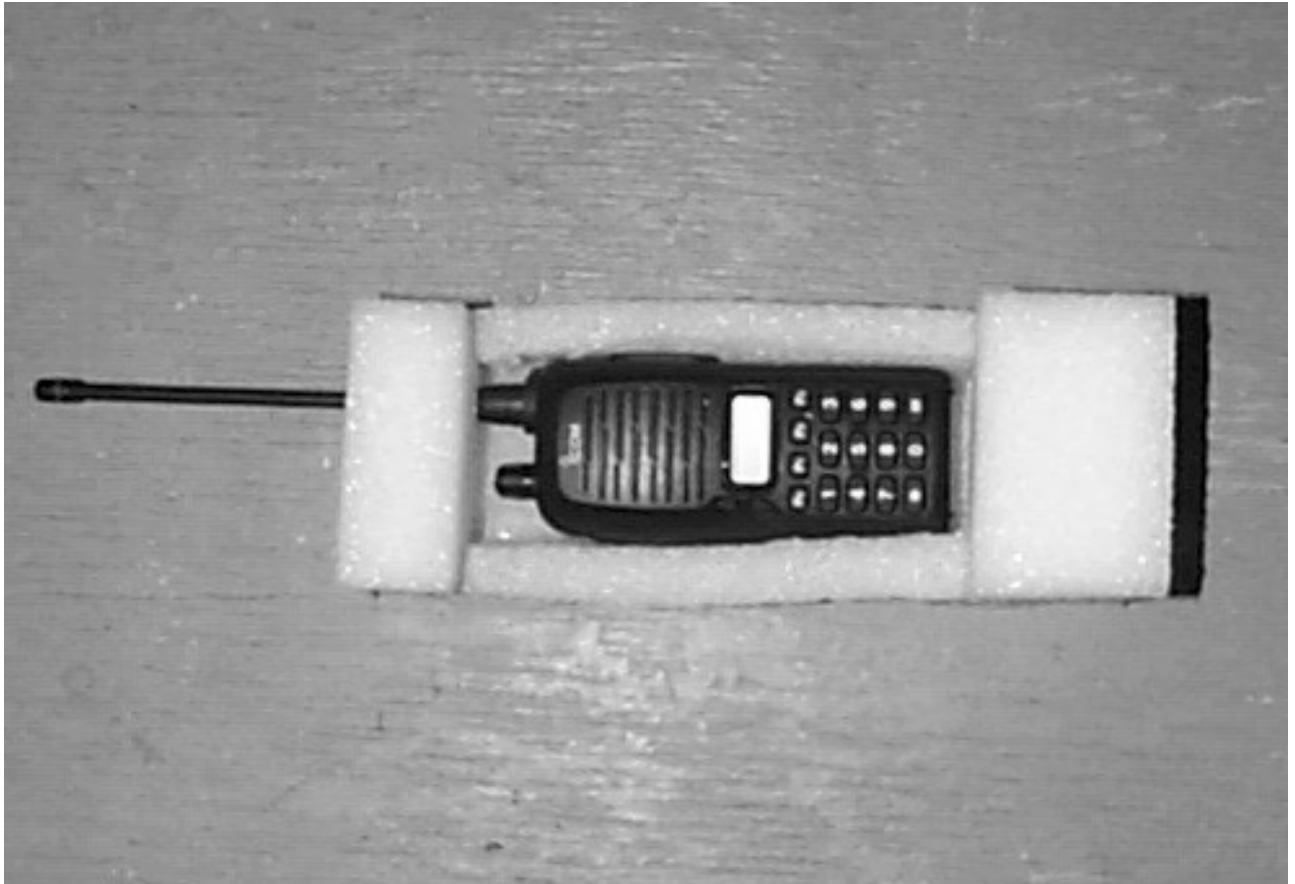
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MFA p0090001, d00a0004

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Simulated Tissue - Compositions Solutions

1. Brain Tissue: See Below
2. Muscle Tissue: See Below

MFA LAB REPORTRecipe and Preparation: 400 - 500 MHz

The table lists the compositions and conductivity of liquid muscle and brain based on George Hartsgrrove and Colleagues in University of Ottawa Ref.; Bioelectromagnetics 8:29-36 (1987). The conductivities are within a 5% target value.

Frequency 400-500 MHz

<u>Ingredient</u>	<u>Muscle Mixture</u>	<u>Brain Mixture</u>
Water	38.56%	42.92%
Sugar	56.32%	58.42%
Salt	3.95%	1.00%
HEC	0.98%	0.30%
Bactericide	0.19%	0.10%
Conductivity	0.832	0.545

1. Weigh all ingredients accurately
2. Heat water 40°C
3. Add salt to bactericide while stirring
4. Add sugar
5. Continue to stir and add hydroxyethylcellulose (HEC)
6. Remove from heat
7. Continue to stir until mixture thickens
8. Let cool to room temperature
9. Keep in closed container when not in use

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Method for Determining Value of SAR

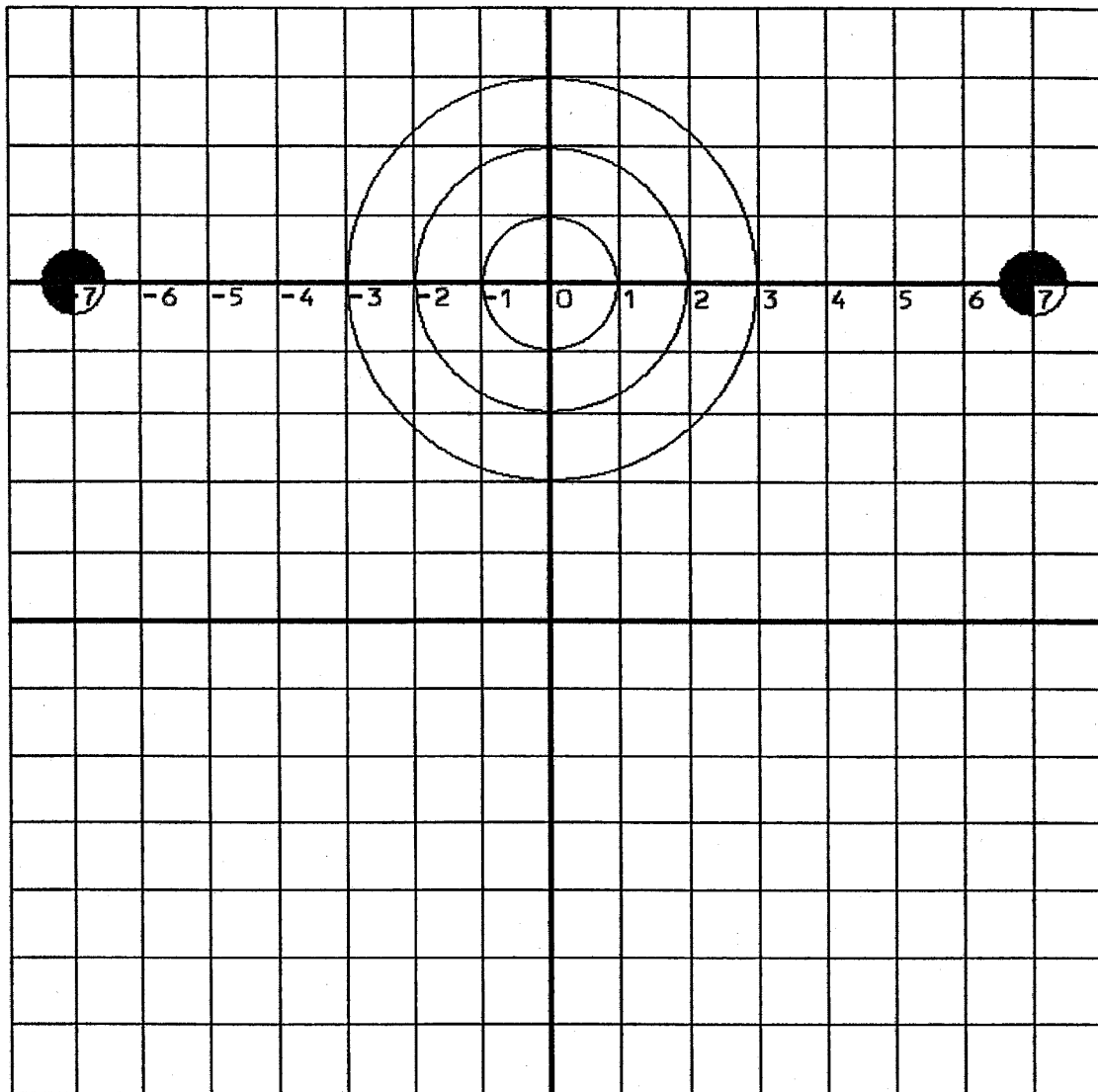
Initially a coarse scan is performed over an area of 5 cm x 5 cm closest to the antenna port. The coarse scan is used to determine the location of the max value using the X - Y table. The center of this location is used to perform a more detailed scan over a 1.5 cm x 1.5 cm grid. Neighboring 1 cm x 1 cm grids are then checked for possibility of higher values.

X - Y Table

Repeatability: >10% of 1 cm

Resolution: >10% of 1 cm

Grid of Bottom of Phantom



TESTIMONIAL
AND
STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY THAT:

1. THAT the application was prepared either by, or under the direct supervision of, the undersigned.
2. THAT the technical data supplied with the application was taken under my direction and supervision.
3. THAT the data was obtained on representative units, randomly selected.
4. THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

CERTIFYING ENGINEER:

A handwritten signature in black ink, appearing to read "M. Flom P. Eng.", with a horizontal line drawn underneath the signature.

Morton Flom, P. Eng.