



January 10, 2002

Federal Communications Commission
Equipment Approval Services
7435 Oakland Mills Road
Columbia, MD 21046
Attn: Martin Perrine

SUBJECT: E F Johnson Company
FCC ID: ATH2425110
731 Confirmation No.: EA649893
Correspondence Ref. No.: 21627

Dear Martin:

Submitted on behalf of E F Johnson Company is our response to SAR items 3-5 referenced in your e-mail dated January 3, 2002 requesting additional information for the subject application.

1. The tissue parameters listed in the SAR measurement report were target parameters. Please find attached revised SAR test report pages (3, 4, 7, & 8) listing the measured dielectric tissue parameters, and dielectric property measurement printouts for all measured liquid.
2. Please find attached Z axis SAR scan data for the highest measured face and body SAR test points.
3. Please see the attached documentation regarding worst-case SAR analysis.

If you have any further questions regarding the above, please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Shawn McMillen", followed by a vertical line.

Shawn McMillen
General Manager
Celltech Research Inc.
Testing & Engineering Lab

cc: E F Johnson Company
Rhein Tech Labs

4.0 MEASUREMENT SUMMARY

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the EUT are reported in Appendix A.

Face-Held SAR Measurements

Freq. (MHz)	Chan.	Mode	Cond. Power Before (W)	Cond. Power After (W)	Antenna Position	Antenna P/N	Separation Distance (cm)	SAR (w/kg)	
								100% Duty Cycle	50% Duty Cycle
136.00	Low	CW	5.8	5.76	Fixed	501-0017-101	2.5	0.310	0.155
155.00	Mid	CW	5.8	5.72	Fixed	501-0017-103	2.5	1.54	0.770
174.00	High	CW	5.8	5.74	Fixed	501-0017-105	2.5	0.752	0.376
Mixture Type: Brain (Measured) Dielectric Constant: 53.4 Conductivity: 0.76					ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Controlled Exposure / Occupational BRAIN: 8.0 W/kg (averaged over 1 gram)				

Notes:

1. The SAR values found were below the maximum limit of 8.0 w/kg (controlled exposure).
2. The highest face-held SAR value found was 1.54 w/kg (100% duty cycle).
3. The EUT was tested for face-held SAR with a 2.5cm separation distance between the front of the EUT and the outer surface of the planar phantom.
4. Ambient TEMPERATURE: 23.3 °C
Relative HUMIDITY: 57.5 %
Atmospheric PRESSURE: 100.4 kPa
5. Fluid Temperature 23.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.



Face-held SAR Test Setup
2.5cm Separation Distance

150MHz

Measured Liquid Dielectric Parameters (Brain)

October 24, 2001 09:15 AM

Frequency	e'	e''
100.000000 MHz	58.7508	128.7991
102.000000 MHz	58.6384	126.3042
104.000000 MHz	58.4864	124.6116
106.000000 MHz	58.6159	122.3152
108.000000 MHz	57.7789	120.4905
110.000000 MHz	57.8157	118.5415
112.000000 MHz	57.2508	117.0199
114.000000 MHz	57.2948	115.1633
116.000000 MHz	56.7854	113.5748
118.000000 MHz	56.4515	111.7548
120.000000 MHz	56.3756	110.1522
122.000000 MHz	56.2139	108.2044
124.000000 MHz	55.8820	106.7239
126.000000 MHz	55.7927	105.3746
128.000000 MHz	55.4237	104.1468
130.000000 MHz	55.3640	102.6565
132.000000 MHz	55.3516	101.4561
134.000000 MHz	55.0268	100.1567
136.000000 MHz	54.5424	99.0859
138.000000 MHz	54.2357	97.7990
140.000000 MHz	54.2366	96.6478
142.000000 MHz	54.1785	95.5032
144.000000 MHz	53.9541	94.4287
146.000000 MHz	53.7658	93.4097
148.000000 MHz	53.4879	92.2299
150.000000 MHz	53.4424	91.1765
152.000000 MHz	53.1347	90.2482
154.000000 MHz	52.8883	89.3406
156.000000 MHz	52.7711	88.3164
158.000000 MHz	52.7139	87.3920
160.000000 MHz	52.6788	86.4120
162.000000 MHz	52.3739	85.5754
164.000000 MHz	52.1083	84.8573
166.000000 MHz	52.0927	84.0902
168.000000 MHz	51.8483	83.2099

170.000000 MHz	51.8867	82.5004
172.000000 MHz	51.7323	81.7965
174.000000 MHz	51.6222	81.0111
176.000000 MHz	51.3086	80.3049
178.000000 MHz	51.3327	79.3822
180.000000 MHz	51.2051	78.6051
182.000000 MHz	51.0729	78.0492
184.000000 MHz	51.1536	77.3103
186.000000 MHz	50.8783	76.5913
188.000000 MHz	50.7765	76.0724
190.000000 MHz	50.5976	75.3747
192.000000 MHz	50.3535	74.6322
194.000000 MHz	50.4678	74.0692
196.000000 MHz	50.3078	73.5384
198.000000 MHz	50.1878	72.9528
200.000000 MHz	50.1683	72.3088

Body-Worn SAR Measurements

Freq. (MHz)	Chan.	Mode	Cond. Power Before (W)	Cond. Power After (W)	Antenna Position	Antenna Type	Belt-Clip Separation Distance (cm)	SAR (w/kg)	
								100% Duty Cycle	50% Duty Cycle
136.00	Low	CW	5.8	5.78	Fixed	501-0017-101	1.3	1.55	0.775
155.00	Mid	CW	5.8	5.75	Fixed	501-0017-103	1.3	1.15	0.575
174.00	High	CW	5.8	5.76	Fixed	501-0017-105	1.3	1.28	0.640
Mixture Type: Body (Measured) Dielectric Constant: 60.3 Conductivity: 0.80					ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Controlled Exposure / Occupational BODY: 8.0 W/kg (averaged over 1 gram)				

Notes:

1. The SAR values found were below the maximum limit of 8.0 w/kg (controlled exposure).
2. The highest body-worn SAR value found was 1.55 w/kg (100% duty cycle).
3. The EUT was tested for body-worn SAR with the attached belt-clip providing a 1.3cm separation distance between the back of the EUT and the outer surface of the planar phantom.
4. Ambient TEMPERATURE: 23.3 °C
Relative HUMIDITY: 57.5 %
Atmospheric PRESSURE: 100.4 kPa
5. Fluid Temperature 23.0 °C
6. During the entire test the conducted power was maintained to within 5% of the initial conducted power.



Body-worn SAR Test Setup
1.3cm Belt-Clip Separation

150MHz

Measured Liquid Dielectric Parameters (Body)

October 24, 2001 09:09 AM

Frequency	e'	e''
100.000000 MHz	62.3282	139.4229
102.000000 MHz	62.2571	137.1549
104.000000 MHz	62.2352	135.0896
106.000000 MHz	62.1281	132.1750
108.000000 MHz	62.1046	130.1626
110.000000 MHz	62.1784	127.9181
112.000000 MHz	61.7700	125.7054
114.000000 MHz	61.4578	123.7459
116.000000 MHz	61.3396	121.9496
118.000000 MHz	61.3144	119.9294
120.000000 MHz	61.3040	118.2149
122.000000 MHz	61.2530	116.4232
124.000000 MHz	61.2270	114.5209
126.000000 MHz	61.1426	112.7799
128.000000 MHz	60.9348	111.1324
130.000000 MHz	60.8973	109.6200
132.000000 MHz	60.9937	108.2691
134.000000 MHz	60.8763	106.5404
136.000000 MHz	60.6650	105.2321
138.000000 MHz	60.8056	103.7591
140.000000 MHz	60.7156	102.4602
142.000000 MHz	60.7441	101.1894
144.000000 MHz	60.5970	99.9078
146.000000 MHz	60.5589	98.5404
148.000000 MHz	60.5534	97.6535
150.000000 MHz	60.2902	96.2573
152.000000 MHz	60.3779	95.1443
154.000000 MHz	60.2501	94.0751
156.000000 MHz	60.0889	93.2477
158.000000 MHz	60.0572	92.0126
160.000000 MHz	60.0832	91.2171
162.000000 MHz	60.0135	90.1925
164.000000 MHz	59.7739	89.2562
166.000000 MHz	59.9697	88.4082
168.000000 MHz	59.9379	87.2521

170.000000 MHz	59.9380	86.5099
172.000000 MHz	59.8467	85.8402
174.000000 MHz	59.8768	84.8897
176.000000 MHz	59.9218	84.1473
178.000000 MHz	59.7924	83.0162
180.000000 MHz	59.7307	82.1346
182.000000 MHz	59.7391	81.5397
184.000000 MHz	59.7810	80.8189
186.000000 MHz	59.6335	79.9956
188.000000 MHz	59.7083	79.1700
190.000000 MHz	59.4896	78.5185
192.000000 MHz	59.4475	77.8648
194.000000 MHz	59.4394	77.1140
196.000000 MHz	59.4642	76.5023
198.000000 MHz	59.3412	75.8951
200.000000 MHz	59.2750	75.2114

8.0 SYSTEM VALIDATION

Prior to the assessment, the system was verified in a large planar phantom with a 300MHz dipole. A forward power of 250mW was applied to the dipole and the system was verified to a tolerance of $\pm 10\%$. The applicable verifications are as follows (see Appendix B for validation test plots and calibration information):

Dipole Validation Kit	Target SAR 1g (w/kg)	Measured SAR 1g (w/kg)	Validation Date
300MHz	0.878	0.898	October 24, 2001

VALIDATION TISSUE MIXTURE (300MHz Brain)	
INGREDIENT	%
Water	37.56
Sugar	55.32
Salt	5.95
HEC	0.98
Bactericide	0.19

VALIDATION TISSUE PARAMETERS (300MHz)			
Tissue Mixture	Dielectric Constant ϵ_r	Conductivity s (mho/m)	ρ (Kg/m ³)
Brain (Target)	$45.3 \pm 5\%$	$0.87 \pm 5\%$	1000
Brain (Measured)	44.8	0.87	1000

300MHz

Measured Liquid Dielectric Parameters (Brain)

October 24, 2001 09:30 AM

Frequency	e'	e''
200.000000 MHz	49.0492	70.4154
204.000000 MHz	48.8455	69.4194
208.000000 MHz	48.5921	68.2276
212.000000 MHz	48.4481	67.3447
216.000000 MHz	48.1427	66.3163
220.000000 MHz	48.0076	65.4242
224.000000 MHz	47.8414	64.5664
228.000000 MHz	47.6364	63.6330
232.000000 MHz	47.4837	62.8344
236.000000 MHz	47.2913	61.9433
240.000000 MHz	47.0525	61.2588
244.000000 MHz	46.9296	60.4677
248.000000 MHz	46.7282	59.7090
252.000000 MHz	46.5412	59.0556
256.000000 MHz	46.3593	58.4061
260.000000 MHz	46.2009	57.7905
264.000000 MHz	46.0324	57.1946
268.000000 MHz	45.8466	56.5406
272.000000 MHz	45.7241	56.0224
276.000000 MHz	45.6464	55.4694
280.000000 MHz	45.4431	54.8402
284.000000 MHz	45.3044	54.3694
288.000000 MHz	45.2172	53.8050
292.000000 MHz	45.0196	53.2672
296.000000 MHz	44.9712	52.6296
300.000000 MHz	44.8149	52.1595
304.000000 MHz	44.6388	51.7317
308.000000 MHz	44.5427	51.2521
312.000000 MHz	44.3520	50.8758
316.000000 MHz	44.2542	50.3397
320.000000 MHz	44.0382	49.9088
324.000000 MHz	43.9359	49.4113
328.000000 MHz	43.7706	49.0227
332.000000 MHz	43.6568	48.6126
336.000000 MHz	43.5309	48.1885

340.000000 MHz	43.4751	47.8158
344.000000 MHz	43.3123	47.4642
348.000000 MHz	43.2359	47.0986
352.000000 MHz	43.0892	46.7376
356.000000 MHz	42.9813	46.3803
360.000000 MHz	42.9295	46.0827
364.000000 MHz	42.8095	45.6954
368.000000 MHz	42.6766	45.3757
372.000000 MHz	42.6423	45.0051
376.000000 MHz	42.5619	44.7155
380.000000 MHz	42.3916	44.4100
384.000000 MHz	42.3553	44.0055
388.000000 MHz	42.2019	43.7118
392.000000 MHz	42.1371	43.4128
396.000000 MHz	42.0346	43.1461
400.000000 MHz	41.9526	42.8609

9.0 EVALUATION SIMULATED TISSUES

The brain and body mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. The fluid was prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

INGREDIENT	MIXTURE %	
	150MHz Brain	150MHz Body
Water	38.35	46.6
Sugar	55.5	49.7
Salt	5.15	2.6
HEC	1.0	1.0
Bactericide	0.1	0.1

10.0 EVALUATION TISSUE PARAMETERS

The dielectric parameters of the fluids were verified prior to the SAR evaluation using an 85070C Dielectric Probe Kit and an 8753E Network Analyzer. The dielectric parameters of the fluid are as follows:

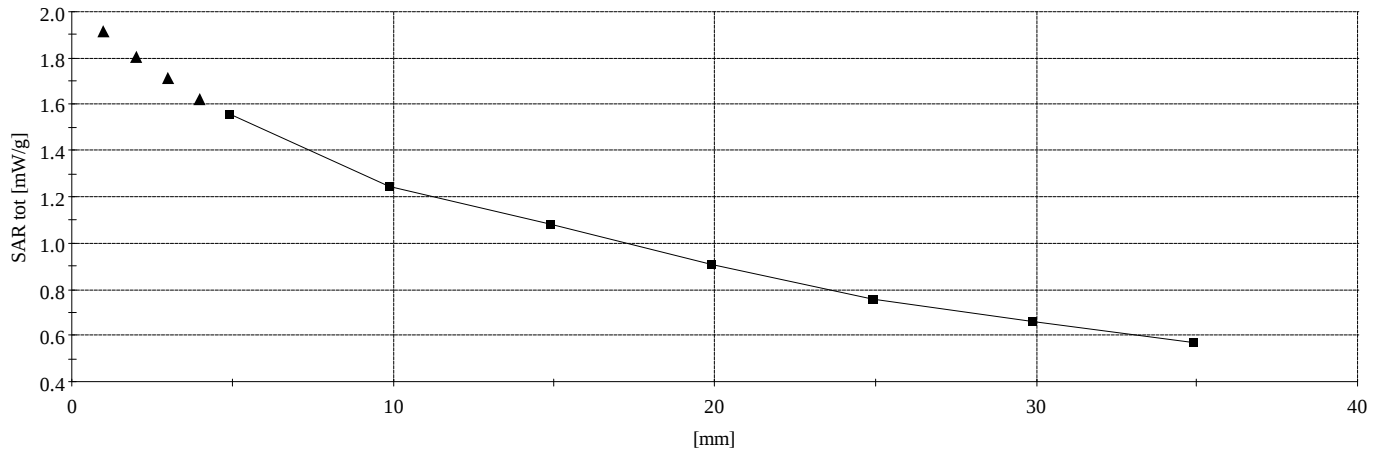
Equivalent Tissue 150MHz	Dielectric Constant ϵ_r	Conductivity s (mho/m)	ρ (Kg/m ³)
Brain (Target)	52.3 $\pm$ 5%	0.76 $\pm$ 5%	1000
Brain (Measured)	53.4	0.76	1000
Body (Target)	61.9 $\pm$ 5%	0.80 $\pm$ 5%	1000
Body (Measured)	60.3	0.80	1000

EF Johnson FCC ID: ALH2425110

Small Planar Phantom; Planar Section
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0;
150 MHz Brain : $\sigma = 0.76$ mho/m $\epsilon_r = 52.3$ $\rho = 1.00$ g/cm³
Cube 4x4x7

Z-Axis Extrapolation at Peak SAR Location

Face SAR at 2.5 cm Separation Distance
Portable VHF PTT Radio Transceiver
Antenna P/N: 501-0017-103
EF Johnson Model: 242-5110/5111
Continuous Wave Mode
Mid Channel [155.000 Mhz]
Conducted Power: 5.80 Watts
Date Tested: October 24, 2001

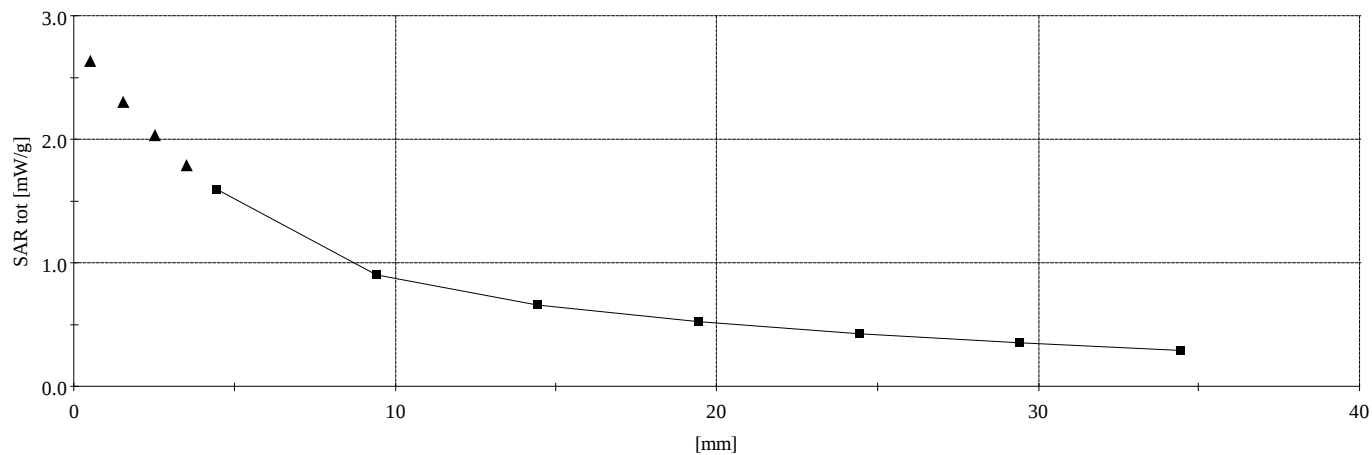


EF Johnson FCC ID: ALH2425110

Small Planar Phantom; Planar Section
Probe: ET3DV6 - SN1590; ConvF(7.71,7.71,7.71); Crest factor: 1.0;
150 MHz Muscle: $\sigma = 0.80$ mho/m $\epsilon_r = 61.9$ $\rho = 1.00$ g/cm³
Cube 4x4x7

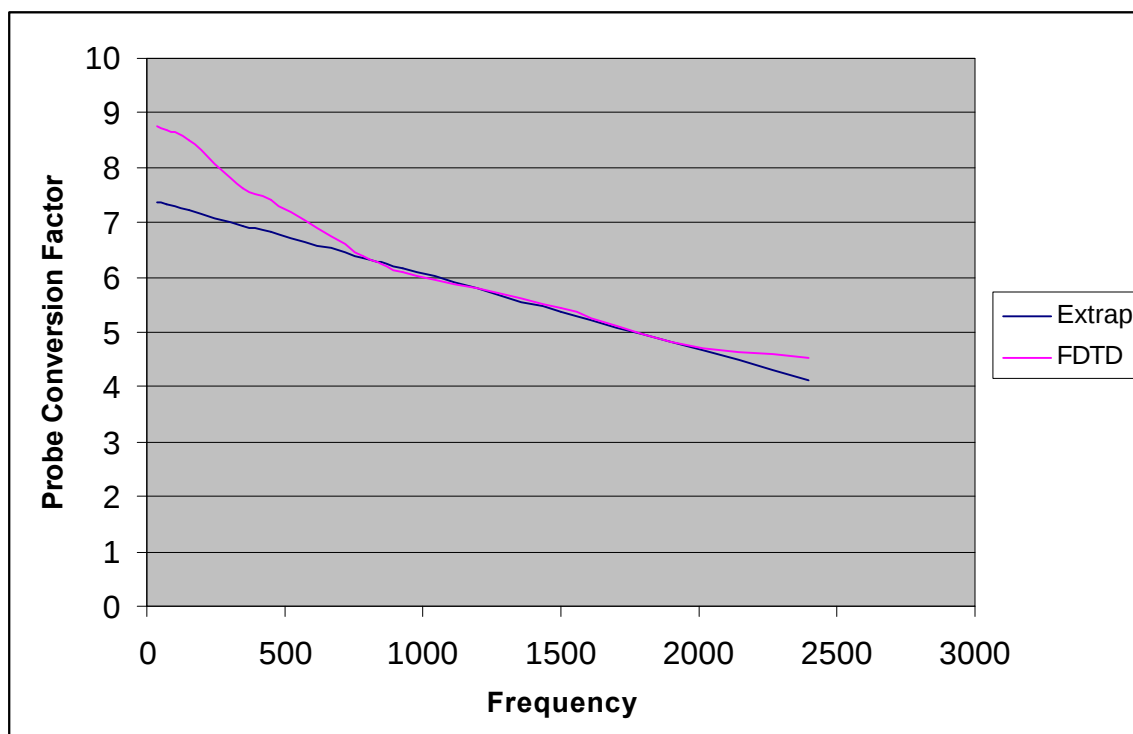
Z-Axis Extrapolation at Peak SAR Location

Body-Worn SAR with 1.3 cm Belt-Clip Separation
Portable VHF PTT Radio Transceiver
Antenna P/N: 501-0017-101
EF Johnson Model: 242-5110/5111
Continuous Wave Mode
Low Channel [136.000 Mhz]
Conducted Power: 5.80 Watts
Date Tested: October 24, 2001



The worst-case SAR analysis using the extrapolated probe conversion factors at 150MHz is as follows:

1. The probe conversion factors at 150MHz were determined using a linear regression based on the two calibrated points of 900 and 1800MHz. Below is an example of an identical probe in which the conversion factors have been determined using numerical methods. As indicated on the graph, as the frequency decreases below 800MHz the numerically derived conversion factors deviate from the linear extrapolated results. At 150MHz, there is approximately an 18% variance between the two conversion factors. For this particular EUT, the maximum face-held SAR measured was 1.54mW/g at 100% duty cycle. By re-evaluating the SAR with 18% lower conversion factors the resulting SAR value at 100% was 1.82mW/g.



2. The probe conversion factors were varied in order to determine the conversion factor value required for the SAR to reach the occupational exposure limit. It was found that a conversion factor of 1.5 gave a SAR value of 7.92mW/g (see SAR test plot - next page).

EF Johnson FCC ID: ALH2425110

Small Planar Phantom; Planar Section; Position: (90°,0°)
Probe: ET3DV6 - SN1590; ConvF(1.50,1.50,1.50); Crest factor: 1.0
150 MHz Brain : $\sigma = 0.76$ mho/m $\epsilon_r = 52.3$ $\rho = 1.00$ g/cm³
Coarse: Dx = 20.0, Dy = 20.0, Dz = 10.0
Cube 4x4x7 Powerdrift: -0.37 dB
SAR (1g): 7.92 mW/g, SAR (10g): 6.35 mW/g

Face SAR at 2.5 cm Separation Distance
Portable VHF PTT Radio Transceiver
Antenna P/N: 501-0017-103
EF Johnson Model: 242-5110/5111
Continuous Wave Mode
Mid Channel [155.000 Mhz]
Conducted Power: 5.80 Watts
Date Tested: October 24, 2001

