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Supplementary Materials for

Computational modeling investigation of pulsed high peak power microwaves and the potential for traumatic brain injury

Amy M. Dagro*, Justin W. Wilkerson, Thaddeus P. Thomas, Benjamin T. Kalinosky, Jason A. Payne

*Corresponding author. Email: amy.m.dagro.civ@mail.mil

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This PDF file includes:

Part	ρ (kg/m³)	ϵ_R	σ_c (S/m)	Ref.
Air	1.16×10^1	1.0	0.0	[47]
Corpus callosum	1.04×10^3	3.9×10^1	5.6×10^{-1}	[47]
Cerebellum gray matter	1.04×10^3	5.3×10^1	9.0×10^{-1}	[47]
Cerebellum white matter	1.04×10^3	3.9×10^1	5.6×10^{-1}	[47]
Ventricles	1.00×10^3	6.8×10^1	2.4	[47]
Cerebrospinal fluid	1.00×10^3	6.8×10^1	2.4	[47]
Gray matter	1.04×10^3	5.3×10^1	9.0×10^{-1}	[47]
Sinus	1.16×10^1	1.0	0.0	[47]
Skull (cranial bone, facial bone, jaw)	1.91×10^3	1.3×10^1	1.3×10^{-1}	[47]
Brain stem	1.04×10^3	5.3×10^1	9.0×10^{-1}	[47]
White matter	1.04×10^3	3.9×10^1	5.6×10^{-1}	[47]
Skin	1.11×10^3	4.2×10^1	8.3×10^{-1}	[47]
Homogeneous body tissue (muscle)	1.10×10^3	5.5×10^1	9.1×10^{-1}	[47]

Table S1. Material properties used in the FDTD simulations. ε_R is the relative permittivity and σ_c is the conductivity. All material properties taken from [47].

Part	Material model	Properties	Ref.
Brain white matter (WM)	Mooney Rivlin w/ Prony series	g_1=0.316, g_2=0.428, $\tau_1 = 3\ s$, $\tau_2 = 0.19\ s$, C_{10}=130 Pa, C_{01}=135 Pa, $\alpha = 6.7 \times 10^{-4}$ / °C K=2 GPa $\rho = 1040$ kg/m³ c_p =3500 J/kg/ °C	[48] [49] [50] [51] [52] [47]
Brain gray matter (GM)	Mooney Rivlin w/ Prony series	g_1=0.335, g_2=0.461, $\tau_1 = 2.4\ s$, $\tau_2 = 0.15\ s$, C10=130 Pa, C01=135 Pa, $\alpha = 2 \times 10^{-4}$ / °C K=2 GPa $\rho = 1040$ kg/m³ c_p =3700 J/kg/ °C	[48] [49] [50] [51] [52] [47]
Skull	Linear elastic	E=1 GPa $\nu = 0.19$ $\rho = 1134$ kg/m³ c_p =1650 J/kg/ °C $\alpha = 2 \times 10^{-5}$ / °C	[53] [54] [55] [47] [56]
CSF and ventricles	Linear elastic	K=2 GPa G=50 Pa $\alpha = 0.6 \times 10^{-4}$ / °C $\rho = 1020$ kg/m³ c_p =4000 J/kg/ °C	[57] [58] [44] [52] [47]

Table S2. Thermomechanical material properties used in FEM simulations.

Geometry	Loading	τ_d (μs)	ΔT_{avg} (°C)	ΔT_{max} (°C)	$\lvert P\rvert_{max}$ (MPa)	Efficiency factor	Ref.
Human	800 MHz	5	0.071	1.07	10.8	6340%	This work

	frontal exposure						
Human	800 MHz frontal exposure	500	0.071	1.07	0.125	73.9%	This work
Human	1 GHz frontal exposure	5	0.044	0.668	6.82	6440%	This work
Human	1 GHz side exposure	5	0.038	0.317	3.85	4230%	This work
Human	1 GHz frontal exposure	1	0.002	0.073	0.31	7180%	This work
Sphere	Uniform heating $1\,^{\circ}C$	5	1.00	1.00	18.7	472%	[18]
Sphere	Uniform heating $8\,^{\circ}C$	0.5	8.00	8.00	149	469%	[18]
Sphere	Surface heating $8\,^{\circ}C$	0.5	2.83	8.00	443	3590%	[18]
Sphere	Core heating $8\,^{\circ}C$	0.5	0.103	8.00	7.34	1790%	[18]

Table S3. Summary of results from simulations presented in this work and Ref. (14). ΔT_{avg} and ΔT_{max} are the average and maximum temperature rises of the brain (white and gray matter). $|P|_{max}$ is the maximum local tensile pressure experienced during the simulation. The efficiency factor is given as $|P|_{max}/3\alpha K\Delta T_{avg}$.

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