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2022 Brain & Human Body Modeling (BHBM) Conference (Online format with limited in-person participation) August 18-19, 2022

A.A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Charlestown MA
[Brain and Human Body Modeling Conference 2022 – Education @ The Martinos Center](https://tmslab.martinos.org/conferences/brain-and-human-body-modeling-conference-2022/)
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Support of the A.A. Martinos Center for Biomedical Imaging, Novocure, Inc., MathWorks, Inc., and the National Institute of Mental Health (NIMH), National Institutes of Health, is greatly acknowledged

It is planned posting recordings of the talks on the Conference website at Massachusetts General Hospital and distributing them through the network of Harvard Medical School

Authors are welcome to submit their work for publication in a dedicated special issue of Physics in Medicine & Biology Journal entitled Electromagnetic Modeling for Brain Stimulation
<https://iopscience.iop.org/journal/0031-9155/page/electromagnetic-modeling-for-brain-stimulation>
 All publications are free of charge

Preliminary Program as of August 8, 2022

Presentation schedule (presentation times have been corrected to accommodate different time zones):
 Review presentations: ~20-30 min (25 min + 5 min for questions)
 All research presentations: 12 min (10 min + 2 min for questions)

All presentations from students (including post doctorate and part-time students) are eligible for student competition 2022 (*the student must be the first, presenting author*). A monetary award (\$1,000, \$500, and \$300) and an award plaque will be mailed to the winners within a month after the end of the conference.
<https://tmslab.martinos.org/conferences/brain-and-human-body-modeling-conference-2022/student-competition/>

2022 BHBM Session Organizers:
 Kyoko Fujimoto, Gregory Noetscher, Konstantin Weise, Sofia Fernandes,
 Aapo Nummenmaa, Sergey Makaroff

Conference Introduction:**Bruce Rosen (MGH)****6.45-6:50 AM****Ishmael Amarreh (NIH/NIMH)****6.50-6:55 AM****Aapo Nummenmaa (MGH)****6.55-7:00 AM****Session I. Featured Talk: Image Segmentation and Model Generation*****Thursday Aug. 18, 2022, Online Presentations*****Chair: Kyoko Fujimoto (GE Healthcare)**

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	John Ashburner j.ashburner@ucl.ac.uk	Segmentation in SPM	Wellcome Centre for Human Neuroimaging, Institute of Neurology, University College London	7:00 – 7:30AM

Session II. Featured Talks: EEG/TES/DBS***Thursday Aug. 18, 2022, Online Presentations*****Chair: Sofia Rita Fernandes (U Lisbon), Zhi-DeDeng (NIH/NIMH)**

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	Jens Haueisen jens.haueisen@tu-ilmenau.de	A high-density 256-channel cap for dry electroencephalography	Technical University Ilmenau University Hospital Jena	7:30 – 8:00AM
2	Carsten H. Wolters carsten.wolters@uni-muenster.de	Targeted and intensity-optimized multi-channel transcranial electric stimulation: New methods and first applications to the human somatosensory system	University of Münster	8:00 – 8:30AM
3	S. R. Fernandes, M. A. Callejón-Leblic, A. Andrade, H. A. Ferreira, P. C. Miranda srcfernandes@fc.ul.pt	Comparing tDCS paradigms for modulation of motor-related connectivity: investigating the relation between the electric field and clinical outcomes	University of Lisbon, University of Seville, Hospital Universitario Virgen Macarena, Seville	8:30 – 9:00AM
4	Zhi-De Deng zhi-de.deng@nih.gov	Electroconvulsive therapy, electric field, neuroplasticity, and clinical outcomes.	National Inst. of Mental Health, USA	9:00 – 9:30AM
5	Cameron C McIntyre cameron.mcintyre@duke.edu	Deep brain stimulation (DBS) for the treatment of movement disorders	Duke University	9:30 – 10:00 AM
10:00 – 10:15 AM Questions to presenters. Open discussion				
10:15 – 10:30 AM 15 min break				

Session III. Featured Talks: TMS

Thursday Aug. 18, 2022, Online Presentations

Chairs: Gesa Hartwigsen (Max Planck Inst.), Aapo Nummenmaa (Massachusetts General Hospital)

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	Hartwig Siebner hartwig@drcmr.dk	TMS of the brain: What is stimulated? – Implications for Brain Modelling	Danish Research Centre for Magnetic Resonance, Copenhagen University Hospital Hvidovre	10:30 – 11 AM
2	K. Weise, O. Numssen, B. Kalloch, A. Thielscher, G. Hartwigsen, T. Knösche kweise@cbs.mpg.de	Precise Motor-Mapping with Transcranial Magnetic Stimulation	Max Planck Inst. for Human Cognitive and Brain Sciences, Technical University Ilmenau	11 – 11:30 AM
3	Aapo R. Nummenmaa anummenmaa@mgh.harvard.edu	Multichannel TMS	Massachusetts General Hospital	11:30 AM– noon
4	Samuel Zibman and Gaby Pell sam@brainsway.com	Capturing the complexity of novel geometric TMS coils	BrainsWay	Noon – 12:30 PM
12:30 – 12:45 PM Questions to presenters. Open discussion				
12:45 – 1:15 PM 30 min lunch break				

Session IV. Research and Review Talks: TES/DBS

Thursday Aug. 18, 2022, Online Presentations

Chairs: Laleh Golestanirad (Northwestern University), Zhi-De Deng (NIMH)

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	Ricardo Salvador ricardo.salvador@neuroelectrics.com	The role of neurotwins to optimize dose parameters in tES	Neuroelectrics	1:15 – 1:45 PM
2	Kevin A. Caulfield and Mark S. George caulfiel@muscd.edu	When less is more: Computational modeling for high efficiency noninvasive brain stimulation	Medical University of South Carolina Ralph H. Johnson VA Medical Center	1:45 – 1:57 PM student talk
3	P. Franco-Rosado, M. A. Callejón-Leblic, J. Resina-Tosina, L. M. Roa, J. F. Martín-Rodríguez, P. Mir pmir@us.es	Addressing the effect of anatomical variability on electric field focality and orientation under two alternative tDCS montages for motor cortex stimulation	Seville Institute of Biomedicine, Hospital Universitario Virgen de Rocío	1:57 – 2:09 PM

4	K. Weise, W.A. Wartman, T. R. Knösche, A. R. Nummenmaa, S. Makaroff kweise@cbs.mpg.de	Effect of extracerebral brain compartments on the electric fields in TES and TMS	Max Planck Inst. for Human Cognitive and Brain Sciences Technical University Ilmenau, Worcester Polytechnic, Massachusetts General Hospital	2:09 – 2:21 PM
5	F. Jiang, B. Elahi, M. Saxena, I. Telkes, M. DiMarzio, J. G. Pilitsis, L. Golestanirad laleh.rad1@northwestern.edu	Patient-specific modeling of the volume of tissue activated is associated with the clinical outcome of DBS in patients with an obsessive-compulsive disorder	Northwestern University, Albany Medical College	2:21 – 2:33PM student talk
6	K.R. Henry, F. Jiang, B. Elahi, L. Golestanirad kaylee.henry@northwestern.edu	Modeling of directional deep brain stimulation leads requires the addition of lead orientation	Biomedical Engineering, Phys. Therapy & Human Movement Sci., Radiol., Northwestern University	2:33 – 2:45PM student talk
2:45 – 3:00 PM Questions to presenters. Open discussion				

Session V. Research Talks: TMS-A

Thursday Aug. 18, 2022, Online Presentations

Chairs: Hanbing Lu (NINDS), Moritz Dannhauer (NIMH)

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	H. Bagherzadeh, Q. Meng, Z-D Deng, H. Lu, E. Hong, Y. Yang, F-S Choa bagherz1@umbc.edu	Angle-tuned coils: attractive building blocks for TMS with improved depth-spread performance	University of Maryland Massachusetts General Hospital, University of Maryland	3:00 – 3:12PM student talk
2	Moritz Dannhauer moritz.dannhauer@nih.gov	TAP: Targeting and Analysis for neuronavigational TMS	National Institute of Mental Health, USA	3:12 – 3:24PM student talk
3	L. Franke, J. Luob, R. Yanga, S. Pieper, Y. Rath, L. Ning, D. Haehn franke@mpsyh.org	Virtual Reality Visualization of Transcranial Magnetic Stimulation with 3DSlicer and WebXR	University of Massachusetts Boston, Brigham and Women's Hospital, Isomics, Inc	3:24 – 3:36PM
4	J. Luo, L. Franke, S. Pieper, D. Haehn, L. Ning lning@bwh.harvard.edu	Plug-and-play Slicer Module for Real-time TMS Treatment Planning	Brigham and Women's Hospital, University of Massachusetts Boston, Isomics, Inc	3:36 – 3:48PM student talk
5	B. Kalloch, O. Numssen, T. R. Knoesche, G. Hartwigsen, J. Haueisen, K. Weise kalloch@cbs.mpg.de	Optimized Mapping of the Motor Cortex using a Robotic Transcranial Magnetic Stimulation System	Ilmenau University of Technology, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig	3:48 – 4:00PM student talk

6	Zhi-De Deng, Pei Robins, Moritz Dannhauer pei.robins@nih.gov	Comparison of Coil Placement Approaches Targeting Dorsolateral Prefrontal Cortex in Depressed Adolescents Receiving rTMS: An Electric Field Modeling Study	National Institute of Mental Health	4:00 – 4:12PM
4:12 – 4:30PM		Questions to presenters. Open discussion.		

Session V. Research Talks: TMS-B

Thursday Aug. 18, 2022, Online Presentations

Chairs: Tommi Raij (Massachusetts General Hospital), William Wartman (MathWorks, Inc.)

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	M. Tzirini, Y. Roth, T. Harmelech, S. Zibman, G. S. Pell, V. K. Kimiskidis, A. Tendler, A. Zangen, T. Samaras mtzirini@physics.auth.gr	Comparison of EF distributions induced by two TMS coils cleared for OCD	Aristotle University of Thessaloniki, Thessaloniki Software Solution S.A., BrainsWay Ltd. University of Malta	4:30 – 4:42 PM
2	M. Tashli, A. Mhaskar, G. Weistroffer, M. S. Baron, R. L. Hadimani tashlims@vcu.edu	Investigation of Soft Magnetic Material Cores in Transcranial Magnetic Stimulation Coils and the Effect of Changing Core Shapes on the Induced Electrical Field in Small Animals	Virginia Commonwealth University, Hunter Holmes McGuire Veterans Affairs Medical Center, Massachusetts General Hospital	4:42 – 4:54 PM <i>student talk</i>
3	L. Navarro de Lara, Q. Mei, S. Makaroff, J. Stockmann, M. Daneshzand, L. Wald, A. Nummenmaa lnavarrodelara@mgh.harvard.edu	Simulations of the Interactions between a Stimulation Unit and an RF loop for MR imaging	Martinos Center, Worcester Polytechnic, Massachusetts General Hospital	4:54 – 5:06 PM <i>student talk</i>
4	Haowen Wei & Mohammad Daneshzand hwei@wpi.edu	Hardware, real-time signal processing technics, and data collection for TMS induced EMG responses	Worcester Poly, Massachusetts General Hospital	5:06 – 5:18PM <i>student talk</i>
5:18 – 5:30PM		Questions to presenters. Open discussion.		

Session VI. Featured Talk: Generation of Full Body Human Models

Friday Aug. 19, 2022, Online Presentations

Chair: Bastien Guerin (Massachusetts General Hospital)

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	Chansoo Choi & Chan Hyeong Kim cchoi91@hanyang.ac.kr	Next generation of ICRP adult and pediatric computational models and their potential applications	Hanyang University, Korea	7:00 – 7:30AM

Session VII. Clinical Talks: What do clinicians expect from the modelers?

Friday Aug. 19, 2022, Online Presentations

Chair: Samuel Zibman (BrainsWay)

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	Dylan Edwards edwarddy@einstein.edu	Open neurostimulation modeling problems in clinical rehabilitation	Moss Rehabilitation Research Inst., USA	7:30 – 7:50AM
2	Tracy Barbour tbarbour@partners.org	Focusing TMS research on issues most relevant to the treatment of patients	Massachusetts General Hospital	7:50 – 8:10AM
8:10 – 8:20 AM		Questions to presenters. Open discussion		

Session VIII. Research and Review Talks: Multiscale Modeling of Neural Stimulation

Friday Aug. 19, 2022, Online Presentations

Chairs: Konstantin Weise (Max Planck Inst.), Padma Sundaram (Massachusetts General Hospital)

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	A. Fellner, A. Heshmat, P. Werginz, F. Rattay andreas.fellner@tuwien.ac.at	Using COMSOL to model extracellular neural stimulation	Anal Sci Comp/ Bio El, Vienna University of Technology	8:20 – 8:50AM
2	T. P. Mutanen, V. H. Souza, J. O. Nieminen, R. J. Ilmoniemi tuomas.mutanen@aalto.fi	Modeling the cortical activation as a function of the TMS-induced electric-field orientation	Aalto University, University of Helsinki and Helsinki University Hospital	8:50 – 9:02AM student talk
3	T.H. Worbs, C. Röse, T.R. Knösche, K. Weise worbs@cbs.mpg.de	Development of a mean field Approach for cortical neurons under the effects of transcranial magnetic stimulation	Max Planck Inst. for Human Cognitive & Brain Sciences, Technical U. Ilmenau	9:02 – 9:14AM student talk
4	G.M. Noetscher, W.A. Wartman, D. Tang, S.N. Makaroff gregn@wpi.edu	How significant are microscale variations of a macroscopic stimulating electric field in a realistic neuronal arbor?	Worcester Polytechnic Inst., Massachusetts General Hospital	9:14 – 9:26AM
9:26 – 9:30 AM		Questions to presenters. Open discussion		

Session IX. Research and Review Talks: Tumor Treating Fields

Friday Aug. 19, 2022, Online Presentations

Chair: Kristen W. Carlson (BIDMC - Neurology)

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	Anders R. Korshøj andekors@rm.dk	Burr Hole Surgery in Combination with Tumor Treating Fields for Glioblastoma: A Computational Study	Aarhus University Hospital, Denmark, Technical University of Denmark	9:30 – 9:50AM
2	E. Fedorov, G. Noetscher, S. Makaroff efedorov@novocure.com	Effect of extracerebral brain compartments on TTF field doses	Novocure, Inc. Massachusetts General Hospital	9:50 – 10:02AM
10:02 – 10:10AM Questions to presenters. Open discussion				
10:10 – 10:25AM AM 15 min break				

Session X. Research Talks: Transcranial focused ultrasound stimulation

Friday Aug. 19, 2022, Online Presentations

Chair: Bastien Guerin (Massachusetts General Hospital)

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	M. Daneshzand, A. Nummenmaa, J. Li, T. Chou, D. Dougherty, Brian Edlow, B. Guerin mdaneshzand@mg.harvard.edu	Real-time patient-specific acoustic simulation-based neuronavigation tool for transcranial focused ultrasound stimulation	Massachusetts General Hospital	10:25 – 10:37AM student talk
2	Prithvi Nathan & Aapo Nummenmaa pnathan2@illinois.edu	A Finite-Element Analysis Proof of Concept of Ultrasound-Powered Microcoil Magnetic Stimulation	Massachusetts General Hospital, University of Illinois	10:37 – 10:49AM student talk
10:49 – 11:00AM Questions to presenters. Open discussion				

Session XI. Research and Review Talks: High Frequency Modeling in Application to Safety and Imaging

Friday Aug. 19, 2022, Online Presentations

Chairs: Kyoko Fujimoto (GE Healthcare), James Brown (Biotronic)

#	Presenters/email	Title	Organization	Eastern St. Time (USA)
MRI Safety Emphasis				
1	Laleh Golestani Rad laleh.rad1@northwestern.edu	From Bench to Bedside: How Insights from In Silico Medicine Changed the Surgical Practice to	Northwestern University	11:00 – 11:30 AM

		Enhance MRI Safety in Patients with Implants		
2	J. E. Brown, R. Qiang, K. K.N. Kurpad, P. J. Stadnik, J. A. Von Arx, D. Muessig james.brown@biotronik.com	Simulation of Transfer Functions for the Assessment of MRI RF-induced Heating Near AIMDs	Micro Systems Engineering, Inc., USA	11:30 AM–11:42 AM
3	Rosti Lemdiasov & Arun Venkatasubramanian rosti.lemdiasov@cambridgeconsultants.com	Electromagnetic field and SAR in tissues in the proximity of RF coils in application to rechargeable implants	Cambridge Consultants, USA	11:42 – 11:54 AM
4	P. Serano, M. Horner, G. Noetscher, pete.serano@ansys.com	Ansys Testbed for Modeling MRI-Induced RF Heating of Orthopedic Implants	Ansys Inc., USA Worcester Polytechnic Inst.	11:54 – 12:06 AM student talk
5	J. Vu, F. Jianga, B. Bhusal, L. Golestanirad jasmine.vu@northwestern.edu	Assessment of SAR due to cardiac implantable electronic devices (CIEDs) in adults and children in a vertical open-bore MRI environment compared to conventional horizontal MRI	Northwestern University	12:06 – 12:18 AM student talk
Communications and Microwave Imaging Emphasis				
6	J. W. Adams, L. Chen, P. Serano jwadams2@wpi.edu	Miniaturized dual antiphase antenna at 2.4 GHz for microwave imaging	Worcester Polytechnic Inst.	12:18 AM–12:30PM student talk
7	P. Serano, L. Chen, J.W. Adams louis_chen@bose.com	Methods to suppress surface waves in microwave imaging	Worcester Polytechnic Inst. Ansys, Inc., BAE Systems	12:30 – 12:42PM student talk
8	Vishwanath Iyer & Sergey Makaroff viyer@mathworks.com	Full-wave modeling of a simple human head phantom in MATLAB	MathWorks, Inc., Worcester Poly	12:42 – 12:54PM
12:54PM – 1:00PM		Questions to presenters. Open discussion.		
1:00PM – 1:30PM		Lunch Break		

Session XII. Research and Review Talks: Modeling Methods Development

Friday Aug. 19, 2022, Online Presentations

Chair: Manas Rachh (Flatiron Institute, NYC)

#	Presenters/email	Title	Organization	Eastern Standard Time (USA)
1	M. Hoeltershinken, C. Engwer, C. Wolters m_hoel20@uni-muenster.de	The Localized Subtraction Source Model for EEG and MEG Forward Modeling	Biomagnetism and Biosignalanalysis, Math. Westfalian Wilhelms-University Muenster	1:30 – 1:42PM student talk
2	T. Erdbruegger, C. Engwer, C. Wolters t_erdb01@uni-muenster.de	CutFEM forward modeling for EEG-Source Analysis	Biomagnetism and Biosignalanalysis, Math. Westfalian Wilhelms-University Muenster	1:42 – 1:54PM student talk

3	William A. Wartman & Sergey Makaroff wawartman@wpi.edu	Examples of adaptive mesh refinement with boundary element fast multipole method in application to EEG source analysis	Massachusetts General Hospital, Worcester Polytechnic Inst.	1:54 – 2:06PM student talk
4	Manas Rachh & Leslie Greengard mrachh@flatironinstitute.org	Fast Multipole Method with Second Order Boundary Elements: A Primer	Flatiron Institute, Courant Inst. of Mathematics, NYC	2:06 – 2:26PM
2:26 – 2:35PM		Questions to presenters. Open discussion		

Session XIII. Research Talks: TMS-C Advanced TMS Topics

Friday Aug. 19, 2022, Online Presentations

Chair: Padma Sundaram (Massachusetts General Hospital), Lucia Navarro de Lara (Martinos Center)

#	Presenters/email	Title	Organization	Eastern St. Time (USA)
1	H. Nguyen, Y. Yang, H. Lu luha@intra.nida.nih.gov	TMS coils with high inductance and high B field strength are more efficient in inducing suprathreshold motor response in rats	Neuroimaging Research Branch, National Institute on Drug Abuse, Intramural Research Program	2:35 – 2:47PM student talk
2	Mariia Nazarova, Padma Sundaram mnazarova@partners.org	TMS Stimulation of turtle cerebellum (a short overview)	Massachusetts General Hospital	2:47 – 2:59PM student talk
3	William Wartman, Padma Sundaram wawartman@wpi.edu	TMS stimulation of human cerebellum: A case study with the detailed MIDA model	MathWorks, Inc., Massachusetts General Hospital	2:59 – 3:11PM student talk
4	Y Wang, M Daneshzand, I Vora, B Huynh, K, Ackley, A. Nummenmaa, T. Jacobson Kimberley ywang1@mghihp.edu	Coil matters for rTMS dosing: A pilot study using E-field modeling	MGH Institute of Health Professions, Massachusetts General Hospital	3:11 – 3:23PM student talk
5	M. Tashli, M. S. Alam, J. Gong, C. Lewis, C. L. Peterson, H. Eldardiry, J. Atulasimha, R. L. Hadimani tashlims@vcu.edu	Prediction of Stimulation Strength of Transcranial Magnetic Stimulation in the Brain with Deep Encoder-Decoder Convolutional Neural Network	Virginia Commonwealth University, Virginia Tech, Harvard Medical School, Harvard University	3:23 – 3:35PM student talk
6	A. Miles, G. Ornstein, K. Romanova, W. A. Wartman almiles@wpi.edu	TMS GUI in MATLAB: A basic version	Worcester Polytechnic Inst.	3:35 – 3:47PM student talk
3:47 – 3:55PM		Questions to presenters. Open discussion		

Friday Aug. 19, 2022, Online Presentations

Chair: Gregory Noetscher (US ARMY DEVCOM-SC), Aapo Nummenmaa (Mass General Hospital)

Open Discussion on Conference Format and Topics <i>Conference Special Edition of Physics and Medicine Biology Journal</i>	3:55 PM – 4:10 PM
<i>Announcement of Student Competition Winners</i>	4:10 PM – 4:20 PM