List of Publications

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Peer-reviewed scientific articles

1. Santtu Söderholm, Joonas Lahtinen, Carsten H. Wolters, and Sampsa Pursiainen. The effects of peeling on finite element method-based EEG source reconstruction. *Biomedical Signal Processing and Control*, 89:105695, 2024.
2. Maryam Samavaki, Santtu Söderholm, Arash Zarrin Nia, and Sampsa Pursiainen. Modeling of blood flow in cerebral arterial circulation and its dynamic impact on electrical conductivity in a realistic multi-compartment head model. *Computer Methods and Programs in Biomedicine*, 244:107983, 2024.
3. Joonas Lahtinen, Alexandra Koulouri, Stefan Rampp, Jörg Wellmer, Carsten Wolters, and Sampsa Pursiainen. Standardized hierarchical adaptive lp regression for noise robust focal epilepsy source reconstructions. *Clinical Neurophysiology*, 159:24–40, 2024.
4. Fernando Galaz Prieto, Maryam Samavaki, and Sampsa Pursiainen. Lattice layout and optimizer effect analysis for generating optimal transcranial electrical stimulation (TES) montages through the metaheuristic L1L1 method. *Frontiers in Human Neuroscience*, 18:1201574, 2024.
5. Liisa-Ida Sorsa, Yusuf Oluwatoki Yusuf, Astrid Dufaure, Jean-Michel Geffrin, Christelle Eyraud, and Sampsa Pursiainen. Imaging of the internal structure of an asteroid analogue from quasi-monostatic microwave measurement data-II. The time domain approach. *Astronomy & Astrophysics*, 674:A73, 2023.
6. A. Dufaure, C. Eyraud, L.-I. Sorsa, Y.O. Yusuf, S. Pursiainen, and J.-M. Geffrin. Imaging of the internal structure of an asteroid analogue from quasi-monostatic microwave measurement data-I. The frequency domain approach. *Astronomy & Astrophysics*, 674:A72, 2023.
7. Tuomo Poutanen, Sampsa Pursiainen, and Tim Länsivaara. Excessive load. *Frontiers in Built Environment*, 9:1204877, 2023.
8. Tim Erdbrügger, Andreas Westhoff, Malte Höltershinken, Jan-Ole Radecke, Yvonne Buschermöhle, Alena Buyx, Fabrice Wallois, Sampsa Pursiainen, Joachim Gross, Rebekka Lencer, et al. CutFEM forward modeling for EEG source analysis. *Frontiers in Human Neuroscience*, 17:1216758, 2023.
9. Maryam Samavaki, Yusuf Oluwatoki Yusuf, Arash Zarrin Nia, Santtu Söderholm, Joonas Lahtinen, Fernando Galaz Prieto, and Sampsa Pursiainen. Pressure–poisson equation in numerical simulation of cerebral arterial circulation and its effect on the electrical conductivity of the brain. *Computer Methods and Programs in Biomedicine*, 242:107844, 2023.
10. Fernando Galaz Prieto, Joonas Lahtinen, Maryam Samavaki, and Sampsa Pursiainen. Multi-compartment head modeling in EEG: Unstructured boundary-fitted tetra meshing with subcortical structures. *Plos One*, 18(9):e0290715, 2023.

11. Joonas Lahtinen, Fernando Moura, Maryam Samavaki, Samuli Siltanen, and Sampsa Pursiainen. In silico study of the effects of cerebral circulation on source localization using a dynamical anatomical atlas of the human head. *Journal of Neural Engineering*, 20(2):026005, 2023.
12. Joonas Lahtinen, Alexandra Koulouri, Atena Rezaei, and Sampsa Pursiainen. Conditionally exponential prior in focal near-and far-field EEG source localization via randomized multiresolution scanning (RAMUS). *Journal of Mathematical Imaging and Vision*, 64(6):587–608, 2022.
13. Yusuf Oluwatoki Yusuf, Astrid Dufaure, Liisa-Ida Sorsa, Christelle Eyraud, and Sampsa Pursiainen. Investigation of wavelength-induced uncertainties in full-wave radar tomography of high contrast domain: An application to small Solar System bodies. *Icarus*, 387:115173, 2022.
14. Astrid Dufaure, Yusuf Oluwatoki Yusuf, Jean-Michel Geffrin, Liisa-Ida Sorsa, Sampsa Pursiainen, and Christelle Eyraud. Internal probing of an asteroid analogue by electromagnetic method. In *2022 16th European Conference on Antennas and Propagation (EuCAP)*, pages 1–3. IEEE, 2022.
15. Fernando Galaz Prieto, Atena Rezaei, Maryam Samavaki, and Sampsa Pursiainen. L1-norm vs. L2-norm fitting in optimizing focal multi-channel TES stimulation: Linear and semidefinite programming vs. weighted least squares. *Computer Methods and Programs in Biomedicine*, 226:107084, 2022.
16. Liisa-Ida Sorsa, Christelle Eyraud, Alain Hérique, Mika Takala, Sampsa Pursiainen, and Jean-Michel Geffrin. Complex-structured 3D-printed wireframes as asteroid analogues for tomographic microwave radar measurements. *Materials & Design*, 198:109364, 2021.
17. Tuomo Poutanen, Sampsa Pursiainen, and Jari Mäkinen. Test loading of structures with a suspect resistance. *Applied Sciences*, 11(8):3424, 2021.
18. Sophie Schrader, Andreas Westhoff, Maria Carla Piastra, Tuuli Miinalainen, Sampsa Pursiainen, Johannes Vorwerk, Heinrich Brinck, Carsten H. Wolters, and Christian Engwer. Duneuro—a software toolbox for forward modeling in bioelectromagnetism. *Plos One*, 16(6):e0252431, 2021.
19. Qin He and Sampsa Pursiainen. An extended application 'Brain Q' processing EEG and MEG data of finger stimulation extended from 'Zeffiro' based on machine learning and signal processing. *Cognitive Systems Research*, 2021.
20. Laura Valtonen, Sampo Saari, and Sampsa Pursiainen. A matrix-free fixed-point iteration for inverting cascade impactor measurements with instrument's sensitivity kernels and hardware. *Inverse Problems in Science and Engineering*, 29(13):3261–3278, 2021.
21. Atena Rezaei, Joonas Lahtinen, Frank Neugebauer, Marios Antonakakis, Maria Carla Piastra, Alexandra Koulouri, Carsten H. Wolters, and Sampsa Pursiainen. Reconstructing subcortical and cortical somatosensory activity via the RAMUS inverse source analysis technique using median nerve SEP data. *Neuroimage*, 245:118726, 2021.
22. Qin He, Atena Rezaei, and Sampsa Pursiainen. Zeffiro user interface for electromagnetic brain imaging: A GPU-accelerated FEM tool for forward and inverse computations in Matlab. *Neuroinformatics*, 18:237–250, 2020.
23. Ville Koljonen, Olli Koskela, Toni Montonen, Atena Rezaei, Birhanu Belay, Edite Figueiras, Jari Hyttinen, and Sampsa Pursiainen. A mathematical model and iterative inversion for fluorescent optical projection tomography. *Physics in Medicine & Biology*, 64(4):045017, 2019.
24. Christelle Eyraud, L-I Sorsa, A Hérique, J-M Geffrin, S Pursiainen, and W Kofman. Imaging the interior of small solar bodies: towards a quantitative approach. In *2019 International*

Conference on Electromagnetics in Advanced Applications (ICEAA), pages 0695–0695. IEEE, 2019.

25. Liisa-Ida Sorsa, Mika Takala, Patrick Bambach, Jakob Deller, Esa Vilenius, Jessica Agarwal, Kieran A. Carroll, Özgür Karatekin, and Sampsa Pursiainen. Tomographic inversion of gravity gradient field for a synthetic Itokawa model. *Icarus*, 336:113425, 2020.
26. Atena Rezaei, Alexandra Koulouri, and Sampsa Pursiainen. Randomized multiresolution scanning in focal and fast E/MEG sensing of brain activity with a variable depth. *Brain Topography*, 33:161–175, 2020.
27. Atena Rezaei, Marios Antonakakis, Maria Carla Piastra, Carsten H. Wolters, and Sampsa Pursiainen. Parametrizing the conditionally gaussian prior model for source localization with reference to the P20/N20 component of median nerve SEP/SEF. *Brain Sciences*, 10(12):934, 2020.
28. Tuomo Poutanen, Tim Länsivaara, Sampsa Pursiainen, Jari Mäkinen, and Olli Asp. Calculation of safety factors of the eurocodes. *Applied Sciences*, 11(1):208, 2020.
29. Christelle Eyraud, L-I Sorsa, Alain Hérique, J-M Geffrin, S Pursiainen, and W Kofman. Towards asteroid tomography: Modellings and measurements using an analogue model. In *2020 14th European Conference on Antennas and Propagation (EuCAP)*, pages 1–4. IEEE, 2020.
30. Tuuli Miinalainen, Atena Rezaei, Defne Us, Andreas Nüssing, Christian Engwer, Carsten H. Wolters, and Sampsa Pursiainen. A realistic, accurate and fast source modeling approach for the EEG forward problem. *NeuroImage*, 184:56–67, 2019.
31. Liisa-Ida Sorsa, Mika Takala, Patrick Bambach, Jakob Deller, Esa Vilenius, and Sampsa Pursiainen. Bistatic full-wave radar tomography detects deep interior voids, cracks, and boulders in a rubble-pile asteroid model. *The Astrophysical Journal*, 872(1):44, 2019.
32. Olli Koskela, Toni Montonen, Birhanu Belay, Edite Figueiras, Sampsa Pursiainen, and Jari Hyttinen. Gaussian light model in brightfield optical projection tomography. *Scientific Reports*, 9(1):13934, 2019.
33. Defne Us, Ulla Ruotsalainen, and Sampsa Pursiainen. Combining dual-tree complex wavelets and multiresolution in iterative CT reconstruction with application to metal artifact reduction. *BioMedical Engineering Online*, 18:1–16, 2019.
34. Mika Takala, Defne Us, and Sampsa Pursiainen. Multigrid-based inversion for volumetric radar imaging with asteroid interior reconstruction as a potential application. *IEEE Transactions on Computational Imaging*, 4(2):228–240, 2018.
35. Mika Takala, Patrick Bambach, Jakob Deller, Esa Vilenius, Manfred Wittig, Harald Lentz, Hans Martin Braun, Mikko Kaasalainen, and Sampsa Pursiainen. Far-field inversion for the deep interior scanning cubesat. *IEEE Transactions on Aerospace and Electronic Systems*, 55(4):1683–1697, 2018.
36. Patrick Bambach, Jakob Deller, Esa Vilenius, Sampsa Pursiainen, Mika Takala, Hans Martin Braun, Harald Lentz, and Manfred Wittig. DISCUS–the deep interior scanning cubesat mission to a rubble pile near-earth asteroid. *Advances in Space Research*, 62(12):3357–3368, 2018.
37. Olli Koskela, Sampsa Pursiainen, Birhanu Belay, Toni Montonen, Edite Figueiras, and Jari Hyttinen. Computational model for multifocal imaging in optical projection tomography and numerical analysis of all-in-focus fusion in tomographic image reconstruction. In *EMBEC & NBC 2017: Joint Conference of the European Medical and Biological Engineering Conference (EMBEC) and the Nordic-Baltic Conference on Biomedical Engineering and Medical Physics (NBC)*, Tampere, Finland, June 2017, pages 282–285. Springer Singapore, 2018.

38. Tuomo Poutanen, Sampsa Pursiainen, Jari Mäkinen, and Tim Länsivaara. Combination of permanent and variable loads. *Rakenteiden Mekaniikka (Journal of Structural Mechanics)*, 51(1):1–9, 2018.
39. Sampsa Pursiainen, Seok Lew, and Carsten Hermann Wolters. Forward and inverse effects of the complete electrode model in neonatal EEG. *Journal of Neurophysiology*, 117(3):876–884, 2017.
40. Mika Takala, Timo D. Hämäläinen, and Sampsa Pursiainen. The effect of hardware-computed travel time on localization accuracy in the inversion of experimental (acoustic) waveform data. *IEEE Transactions on Computational Imaging*, 3(2):344–354, 2017.
41. Sampsa Pursiainen, Britte Agsten, Sven Wagner, and Carsten H. Wolters. Advanced boundary electrode modeling for TES and parallel TES/EEG. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 26(1):37–44, 2017.
42. Johannes Vorwerk, Christian Engwer, Sampsa Pursiainen, and Carsten H. Wolters. A mixed finite element method to solve the EEG forward problem. *IEEE Transactions on Medical Imaging*, 36(4):930–941, 2016.
43. Sampsa Pursiainen, Johannes Vorwerk, and Carsten H. Wolters. Electroencephalography (EEG) forward modeling via h(div) finite element sources with focal interpolation. *Physics in Medicine & Biology*, 61(24):8502, 2016.
44. S. Pursiainen and M. Kaasalainen. Corrigendum to: "Detection of anomalies in radio tomography of asteroids: source count and forward errors" [Planet. Space Sci. 99 (2014) 36–47]. *Planetary and Space Science*, 125:147–147, 2016.
45. Martin Bauer, Sampsa Pursiainen, Johannes Vorwerk, Harald Köstler, and Carsten H. Wolters. Comparison study for Whitney (Raviart–Thomas)-type source models in finite-element-method-based EEG forward modeling. *IEEE Transactions on Biomedical Engineering*, 62(11): 2648–2656, 2015.
46. Sampsa Pursiainen and Mikko Kaasalainen. Electromagnetic 3D subsurface imaging with source sparsity for a synthetic object. *Inverse Problems*, 31(12):125004, 2015.
47. S. Pursiainen and M. Kaasalainen. Detection of anomalies in radio tomography of asteroids: Source count and forward errors. *Planetary and Space Science*, 99:36–47, 2014.
48. S. Pursiainen and M. Kaasalainen. Iterative alternating sequential (IAS) method for radio tomography of asteroids in 3D. *Planetary and Space Science*, 82:84–98, 2013.
49. S. Pursiainen, F. Lucka, and Carsten H. Wolters. Complete electrode model in EEG: Relationship and differences to the point electrode model. *Physics in Medicine & Biology*, 57(4):999, 2012.
50. Felix Lucka, Sampsa Pursiainen, Martin Burger, and Carsten H. Wolters. Hierarchical Bayesian inference for the EEG inverse problem using realistic FE head models: Depth localization and source separation for focal primary currents. *NeuroImage*, 61(4):1364–1382, 2012.
51. Sampsa Pursiainen. Raviart–Thomas-type sources adapted to applied EEG and MEG: Implementation and results. *Inverse Problems*, 28(6):065013, 2012.
52. S. Pursiainen and M. Kaasalainen. Three-dimensional radio tomography for an asteroid with a hierarchical Bayesian inverse approach. *Asteroids, Comets, Meteors*, 1667:6128, 2012.
53. Sampsa Pursiainen, Alberto Sorrentino, Cristina Campi, and Michele Piana. Forward simulation and inverse dipole localization with the lowest order Raviart—Thomas elements for electroencephalography. *Inverse Problems*, 27(4):045003, 2011.
54. Daniela Calvetti, Harri Hakula, Sampsa Pursiainen, and Erkki Somersalo. Conditionally gaussian hypermodels for cerebral source localization. *SIAM Journal on Imaging Sciences*, 2(3):879–909, 2009.

55. Sampsa Pursiainen. Coarse-to-fine reconstruction in linear inverse problems with application to limited-angle computerized tomography. *Journal of Inverse and Ill-Posed Problems*, 16(9):873–886, 2008.
56. Sampsa Pursiainen. EEG/MEG forward simulation through h-and p-type finite elements. In *Journal of Physics: Conference Series*, volume 124, page 012041. IOP Publishing, 2008.
57. Nuutti Hyvonen, Harri Hakula, and Sampsa Pursiainen. Numerical implementation of the factorization method within the complete electrode model of electrical impedance tomography. *Inverse Problems and Imaging*, 1(2):299, 2007.
58. Sampsa Pursiainen. Two-stage reconstruction of a circular anomaly in electrical impedance tomography. *Inverse Problems*, 22(5):1689, 2006.
59. Sampsa Pursiainen and Harri Hakula. A high-order finite element method for electrical impedance tomography. *PIERS Online*, 2(3):260–264, 2006.

Non-refereed scientific articles

1. Mika Takala, Valentin Tertius Bickel, Patrick Bambach, Hans Martin Braun, and Sampsa Pursiainen. The stepped frequency GPR: A proposal to investigate the lunar subsurface. In *Geophysical Research Abstracts*, volume 21, 2019.
2. Jakob Deller, Esa Vilenius, Olaf Roders, Özgür Karatekin, Sampsa Pursiainen, Koji Wada, Paolo Tortora, Tomáš Kohout, and Patrick Bambach. Asteroid in-situ interior investigation-3way: Understanding the formation processes and evolution of small Solar System bodies. In *EPSC-DPS Joint Meeting 2019*, volume 2019, pages EPSC–DPS2019, 2019.
3. Mika Takala, Patrick Bambach, Jakob Deller, Esa Vilenius, Manfred Wittig, Harald Lentz, Hans Martin Braun, and Sampsa Pursiainen. Cubesat based radio tomography for a rubble pile asteroid: Discus mission concept. In *2018 2nd URSI Atlantic Radio Science Meeting (AT-RASC)*, pages 1–1. IEEE, 2018.
4. Patrick Bambach, Jakob Deller, Joachim Martel, Esa Vilenius, Hannah Goldberg, Liisa-Ida Sorsa, Sampsa Pursiainen, Mika Takala, Andreas Wurster, Hans Martin Braun, et al. What's inside a rubble pile asteroid? Discus—a tomographic twin radar cubesat to find out. In *69th International Astronautical Congress*, Bremen, 2018.
5. Esa Vilenius, Cassian Herbon, Patrick Bambach, Jakob Deller, Sampsa Pursiainen, Mika Takala, Liisa-Ida Sorsa, Hans Martin Braun, Harald Lentz, and Manfred Wittig. Preparing for the Discus mission: Target selection and radiation environment. In *Asteroids and Comets-Inside Out Workshop (ACIO2018)*, 2018.
6. E Vilenius, J Deller, P Bambach, M Takala, S Pursiainen, V Schoeneich, HM Braun, and A Wehr. Discus: Deep interior scanning cubesat—a mission for imaging the interior structure of a rubble pile asteroid using radar tomography. In *1st IUGG Symposium on Planetary Science*, 2017.
7. Olli Koskela, Birhanu Belay, Sampsa Pursiainen, Edite Figueiras, and Jari Hyttinen. Computational model for simulating multifocal imaging in optical projection tomography. In *Mathematics in Imaging*, pages MTu1C–3. Optica Publishing Group, 2017.
8. S Pursiainen and M Kaasalainen. 3D subsurface imaging techniques with signal sparsity for asteroid interiors. In *Spacecraft Reconnaissance of Asteroid and Comet Interiors*, 1829:6016, 2015.
9. Sampsa Pursiainen. Sparse source approaches to radio tomography of asteroid. In *40th COSPAR Scientific Assembly*, 40:B0–4, 2014.
10. Sampsa Pursiainen, M Kaasalainen, et al. Single vs. multiple transponders for radio to-

mography of asteroids. In *AAS/Division for Planetary Sciences Meeting Abstracts #45*, volume 45, pages 208–25, 2013.

11. Sampsa Pursiainen, Martin Burger, and Carsten H. Wolters. Hierarchical bayesian models for EEG inversion: Depth localization and source separation for focal sources in realistic FE head models. In *Biomedical Technology Conference (BMT) 2011*, Freiburg, 2011.
12. F Lucka, Sampsa Pursiainen, M Burger, and CH Wolters. Hierarchical bayesian models for EEG inversion: Depth localization and source separation for focal sources in realistic FE head models. *Biomedizinische Technik*, 56(SUPPL. 1), 2011.