**Dr. Axel Thielscher, Associate Professor**

DTU HEALTH TECH
Department of Health Technology
Technical University of Denmark
Ørsteds Plads, Building 349, room 118
2800 Kgs. Lyngby
Ph. +45 45 25 53 13
email: axthi@dtu.dk

My vision is to transform transcranial brain stimulation (TBS) into an effective medical treatment by personalizing established TBS methods and introducing novel TBS approaches with complementary application profiles. In addition, I aim to provide basic neuroscience research with precise interventional tools to demonstrate causally the link from brain activity to behaviour. My research interests revolve around interfacing engineering with neuroscience research and applications. This includes the integration of brain stimulation with brain imaging modalities as well as computational dosimetry methods for brain stimulation.

I have focused my research on testing the mechanisms of action of TBS and on identifying the factors that cause variability in the stimulation outcome and hamper the clinical efficacy of TBS. My results show that the physical TBS fields strongly depend on the individual anatomy, making an intuitive targeting and dose control impossible and suggesting the need for advanced dosing approaches. In addition, I use neuroimaging to shed light on the stimulation effects at the brain network level and to characterize how the neural TBS effects depend on the physical TBS fields and the brain state.

I aim to translate the results from my basic research to clinical TBS applications by providing experimenters, engineers and clinicians worldwide with validated and useful methods and tools for the personalization of TBS. I am heading the SimNIBS project (Simulation of Non-Invasive Brain Stimulation) that developed the first open-source software pipeline for individualized FEM calculations for brain stimulation based on MR images, and that is now widely used in the field.
Please visit the homepage of my Neurophysics group for an overview of our research projects.

<u>Title of the lecture</u>

**Computational dosimetry for transcranial brain stimulation**

Computational methods are increasingly used for the planning and analysis of transcranial brain stimulation interventions. These methods build upon simulations of the current flow induced by the stimulation in the human brain and are informed by volume conductor models of the head derived from structural MR data. Their use cases range from engineering research, where the aim often is to optimize the stimulation hardware and methods, to clinical studies which aim to assess the relation between individual dose difference and treatment outcome and to personalize the treatment. In my talk, I will give an overview of recent methodological developments and remaining methodological challenges, and highlight the potential of computational dosimetry to improve the clinical efficacy of transcranial brain stimulation.