H a b i l i t a t i o n

Freie Universität Berlin
Fachbereich Physik

Arnimallee 14, 14195 Berlin, FB Raum (1.1.16)

Im Zuge seines Habilitationsverfahrens wird

Herr Dr. Alexander Schnegg

HZB

am **Mittwoch**, d. **08. Mai 2019** um **14.15 Uhr** seinen öffentlichen wissenschaftlichen Vortrag über das Thema:

„Towards Wearable Magnetoencephalography"

halten. Anschließend findet eine öffentliche Aussprache statt.

Der Vorsitzende der Habilitationskommission

Abstract: Monitoring brain function in vivo with physical methods has been one of the major scientific achievements during the last three decades. Currently, a new revolution in functional brain research is taking shape by the construction of portable Magnetoencephalography (MEG) scanners. An MEG records brain activity by measuring the magnetic fields induced by electrical currents in neurons. Temporal and spatial magnetic field measurements allow for mapping brain activity, the localization of neuronal pathologies as well as studies in psychiatric disorders. The two main challenges in MEG development are: Firstly, the integration of sensors, which are capable of measuring magnetic fields in the femtotesla range with ms temporal resolution. Secondly, finding the best solution to the inverse problem of determining the location of electric currents in the brain with mm resolution from magnetic fields outside the skull. Modern MEGs make use of head probes set in a helmet-shaped vacuum flask that contain up to 300 liquid helium cooled superconducting quantum interference device (SQUID) sensors. Very recently, MEG experienced a major technological breakthrough by the replacement of the bulky and expensive SQUID probes with optically pumped magnetometers operating at room temperature. Rapid progress in the integration of these devices in fully portable MEG scanners has the potential to provide an easy and accessible highly sensitive brain diagnostic with high spatial and temporal resolution. Herein the physical foundations and challenges of MEG are presented alongside current breakthroughs in the field.