PRESS RELEASE

Quantum sensors for brain research

Brain researchers have high hopes for quantum sensors to provide deeper insights into the brain one day. This is also a research focus of Fraunhofer IPM. Two events in December provided an insight into the topic: Professor Svenja Knappe delivered a public Carl-Zeiss-Humboldt Lecture to show how quantum sensor technology could advance brain diagnostics and therapy, and an experts' workshop explored the topic of optically pumped magnetometers for magnetoencephalography.

Modern quantum sensors generate magnetic fields that can visualize brain waves, enabling real-time imaging measurements of brain activity with unprecedented quality, and without any radiation exposure. This highly sensitive 3D imaging technology offers a wealth of opportunities for medical research, diagnostics and therapy.

Carl-Zeiss-Humboldt Lecture at the University of Freiburg

Professor Svenja Knappe, quantum optician at the University of Colorado Boulder, is one of the pioneers in the field of highly sensitive quantum sensors. Professor Knappe's work was honored with the highly endowed Carl-Zeiss-Humboldt Research Award 2023, which enabled her to spend time researching at the University of Freiburg and Fraunhofer IPM. Director Professor Karsten Buse, who nominated Knappe for the research prize, is delighted with the lively cooperation. He stressed that making research accessible to the public is particularly important in this day and age.

On December 11, in connection with her award, Professor Knappe gave a lecture entitled: "Will we soon be able to see thoughts? – Quantum sensor technology for medicine, diagnostics and communication". Organized by the University of Freiburg in cooperation with Fraunhofer IPM, and sponsored by the Carl-Zeiss-Stiftung, the event was open to scientists as well as the general public. The audience were impressed with Knappe's presentation: She not only talked about her research, but also illustrated how effective and strategic the sponsorship of the Carl Zeiss Foundation and the Humboldt Foundation is.

Professor Knappe has spent many years researching magnetic field measurements of the brain, which has led her to the development of particularly compact quantum sensors, optically pumped magnetometers (OPM). OPMs are set to replace today's complex laboratory set-ups. Unlike conventional imaging examination methods, quantum sensors allow a more precise examination of the brain. Integrated into an adjustable helmet, the sensors can be used to examine patients of any age, which

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makes it particularly beneficial to medical practice. The sensors should one day come down in price, giving more people access to better treatment methods than before.

Workshop: Optically pumped magnetometers for magnetoencephalography

Optically pumped magnetometers and their application in magnetoencephalography (MEG) were also explored at the first two-day OPM-MEG workshop organized by Fraunhofer IPM together with the University of Freiburg's research center, BrainLinks-BrainTools. On December 12 and 13, around 60 experts met to discuss the potential of OPM technology with a special focus on brain diagnostics.

A team at Fraunhofer IPM is researching OPMs for various applications, including measuring the magnetic activity of the brain, as part of the Fraunhofer lighthouse project QMag. Further information about QMag.

Professor Svenja Knappe's research focuses on quantum sensors, or optically pumped magnetometers (OPM). Image: © K.-U. Wudtke / Fraunhofer IPM

(from left to right): Lukas Findeisen (Program Manager at Carl-Zeiss-Stiftung), Dr. Monika Schatz (Program Manager at Carl-Zeiss-Stiftung), Prof. Dr. Svenja Knappe (University of Colorado Boulder), Dr. Rebecca Großmann (Program Director at The Humboldt Foundation) and Prof. Dr. Karsten Buse (University of Freiburg/Director Fraunhofer IPM) Image: © K.-U. Wudtke / Fraunhofer IPM

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