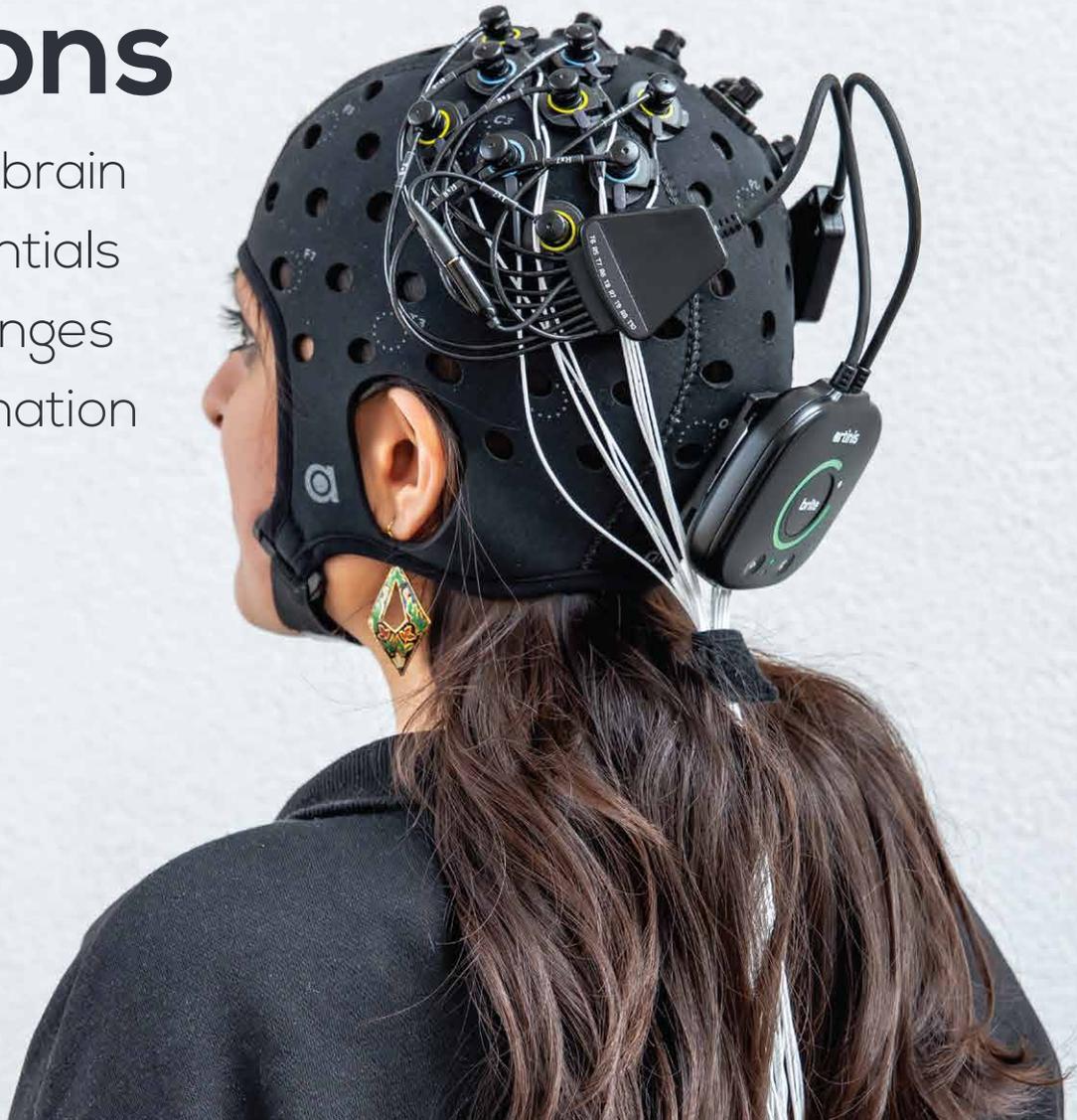


# fNIRS - EEG solutions

Measure both brain electrical potentials (EEG) and changes in brain oxygenation (NIRS)



Truly wearable system to simultaneously measures electrical brain potentials (EEG) and changes in brain oxygenation (fNIRS).



Up to 54 fNIRS channel and up to 64 EEG channels.



Ideal to measure from any cortical region and in a wide range of participants.



Various ways to synchronize with other modalities possible.



Different software integration possibilities available.



Combined NIRS / EEG headcap with optode holders that fit both optodes and electrodes.

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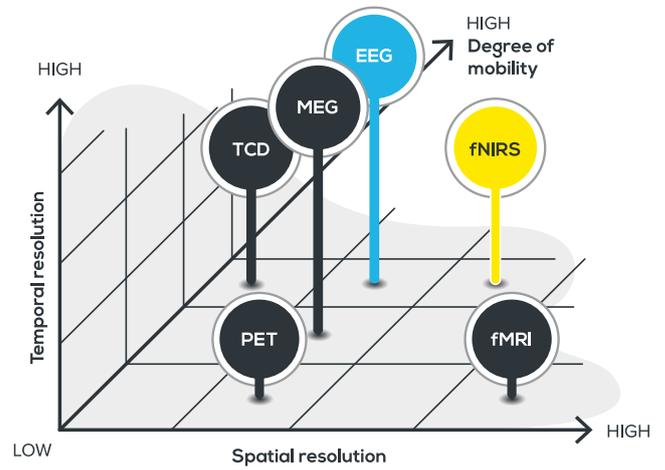
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The Netherlands

# Why combine fNIRS and EEG

The combination of EEG and NIRS gives you the possibility to measure both neural and hemodynamic activity simultaneously, providing complementary information about brain function.

EEG captures electrical activity of the brain from placing electrodes on the head. On the other hand, fNIRS can measure the hemodynamic response, the adjustment in blood oxygen levels when a brain region gets more active and energy demand increases. When combining EEG and NIRS, information of both neural and hemodynamic activity can be acquired, obtaining a more complete picture of the subject's brain activity.

In addition, fNIRS and EEG have complementary temporal and spatial resolution. Brain electrical activity is fast paced, and it can be measured on a scale of milliseconds with EEG by using high sampling rates. Differently, the hemodynamic response usually shows a delay of 5 to 10 seconds. Moreover, due to volume conduction, spatial resolution of EEG is lower than NIRS, which in contrast measures local brain activity.



## Combining the best of both worlds

fNIRS and EEG are two techniques that complement each other perfectly and can be used as a combined neuroimaging solution in many application areas, such as neuroscience, psychology, clinical research or sports science.

### MOBILITY

Our wearable NIRS-EEG packages provide solutions to wear the entire devices on the headcap, on the arm, or in a small backpack, and can connect wirelessly to the acquisition software. This grants a perfect solution to get a more complete picture of the brain. Especially during experiments involving movement, for instance walking or biking, and even in real-world scenarios outside of typical lab settings.

### INTEGRATION

With some of our NIRS-EEG packages (TMSi-Brite and TMSi-Brite Lite), we offer a fully integrated holder enabling both EEG electrode and fNIRS optode to be placed on the same spot. This facilitates the set-up and increases combination possibilities of the two modalities, especially when full head coverage is desired.



### FLEXIBILITY

To ensure complete flexibility in providing the perfect NIRS-EEG solution for your research, we offer a selection of different fNIRS and EEG devices to choose from. From full head coverage, with 54 fNIRS- and up to 64 EEG channels, to measurements in more specific regions and on more sensitive subjects, with 8 channels per modality – everything is possible.

## Synchronization

When performing multimodal measurements, synchronization of data acquired with each system is crucial for further analysis. Different synchronization solutions for EEG and fNIRS data are available, depending on devices and experimental set-up.

OxySoft, our proprietary acquisition software, offers native support and data integration for TMSi EEG devices. Further, data recorded with Neuroelectrics devices can be easily streamed into OxySoft using Lab Streaming Layer (LSL), ensuring event and data synchronization.



# Craft your solution

## 1 Wearable fNIRS system



### BRITE

The Brite is our most advanced wearable and user-friendly device, measuring brain oxygenation from any cortical brain region with up to 27 channels. While being very lightweight and fully wearable, it offers maximum freedom for both researcher and participant, with many options for optode templates.

or



### BRITE LITE

The Brite Lite is a flexible and wireless fNIRS device measuring brain activity from any cortical region with up to 10 channels. Weighing less than 210 g and offering short channel upgrades, it allows for a lot of flexibility in the location and/or subject to be measured.

## 2 Wearable EEG system



### TMSI - APEX

The APEX is a high-quality and lightweight EEG amplifier. It can be connected wireless or wired, worn on different body parts and hence offers a lot of flexibility in your research. Next to the APEX, we can also offer other TMSi solutions.

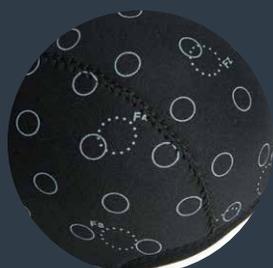
or



### NEUROELECTRICS ENOBIO

The Neuroelectrics Enobio EEG system is a truly wearable EEG system with 8, 20 or 32 EEG channels. The control unit can be attached to the headcap ensuring flexibility, comfort, and enabling measurements in movement.

## 3 Headcaps & holders



### NEOPRENE HEADCAP

We designed our own neoprene headcaps that cover the complete brain and guarantee an ergonomic fit, while perfectly shielding ambient light. They come with printed optode marks and 10/20 system indications.

+



### OPTODE HOLDERS

We offer different holder systems, including an integrated holder enabling the placement of optode and electrode in the same holder. fNIRS and EEG can be set up together in one headcap using different types of holders.



**Wearable  
fNIRS - EEG systems**



# References to NIRS - EEG

- Kwak, Y., Song, W. J., & Kim, S. E. (2023). FGANet: fNIRS-Guided Attention Network for Hybrid EEG-fNIRS Brain-Computer Interfaces. *IEEE Trans Neural Syst Rehabil Eng.*, 30, 329-339.
- Orcioli-Silva, D., Vitorio, R., Nóbrega-Sousa, P., Beretta, V. S., da Conceição, N. R., Oliveira, A. S., Pereira, M. P., & Gobbi, L. T. B. (2021). Cortical Activity Underlying Gait Improvements Achieved With Dopaminergic Medication During Usual Walking and Obstacle Avoidance in Parkinson Disease. *Neurorehabilitation and Neural Repair*, 35(5), 406-418.
- Anwar, A. R., Muthalib, M., Perrey, S., Galka, A., Granert, O., Wolff, S., Heute, U., Deuschl, G., Raethjen, J., & Muthuraman, M. (2016). Effective Connectivity of Cortical Sensorimotor Networks During Finger Movement Tasks: A Simultaneous fNIRS, fMRI, EEG Study. *Brain Topography*, 29(5), 645-660.
- Abeln, V., Schneider, S., Knicker, A., Schier, T., Hollmann, W., & Strüder, H. K. (2015). Electroocortical and Hemodynamic Changes within the Brain during Incremental Bicycle Exercise in Normoxia and Hypoxia—A Combined EEG/NIRS Study. *Journal of Sports Science*, 33(3).
- Blokland, Y., Spyrou, L., Thijssen, D., Eijsvogels, T., Colier, W., Floor-Westerdijk, M., Vlek, R., Bruhn, J., & Farquhar, J. (2014). Combined EEG-fNIRS Decoding of Motor Attempt and Imagery for Brain Switch Control: An Offline Study in Patients With Tetraplegia. *IEEE Trans Neural Syst Rehabil Eng.*, Mar;22(2), 222-229.
- Dagar, S., Chowdhury, S. R., Bapi, R. S., Dutta, A., & Roy, D. (2016). Near-Infrared Spectroscopy – Electroencephalography-Based Brain-State-Dependent Electrotherapy: a computational approach based on Excitation–Inhibition Balance hypothesis. *Frontiers in Neurology*, 7

**The Combined NIRS / EEG is delivered in a plug-and-play package that includes everything you need to get your research started.**

Visit [artinis.com](https://www.artinis.com) for more publications



## Optical imaging made easy.

Artinis Medical Systems is an innovative Dutch company active in the field of medical research equipment and quality assurance equipment. For more than two decades, we have been providing user-friendly, high-tech solutions for fNIRS measurements and radiological quality management. 2021 remarks our company as **ISO 13485:2016 certified** for our quality management system, following review by the notified body Dekra.

Coming from the research field ourselves, we have a lot of experience in optical oximetry, especially near infrared spectroscopy. Our highly portable and multichannel NIRS devices can be used to monitor oxygen supply non-invasively in both brain and muscle tissue. We participate in various scientific projects and work closely together with numerous universities, companies, and institutions around the globe. With extensive knowledge of the field, we develop top-quality products and go above and beyond to support you.

**At Artinis, we make optical imaging easy.**

**Ask for info**

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