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THE TECHMED EVENT

Pioneering Perspectives:

Sensing and Imaging as Key Enabling Technologies

Bettina Schwab, University of Twente

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Sensing and Imaging for Brain Stimulation

Bettina Schwab – University of Twente

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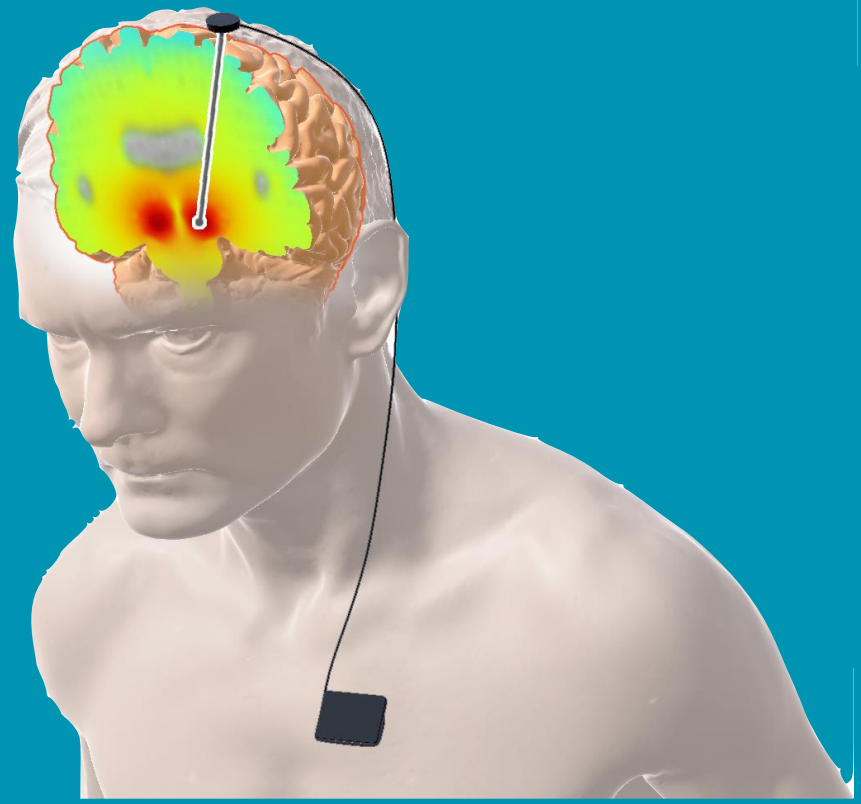
DISCLOSURE SLIDE

No financial interests.

Understanding brain stimulation techniques

Transcranial alternating current stimulation (tACS)



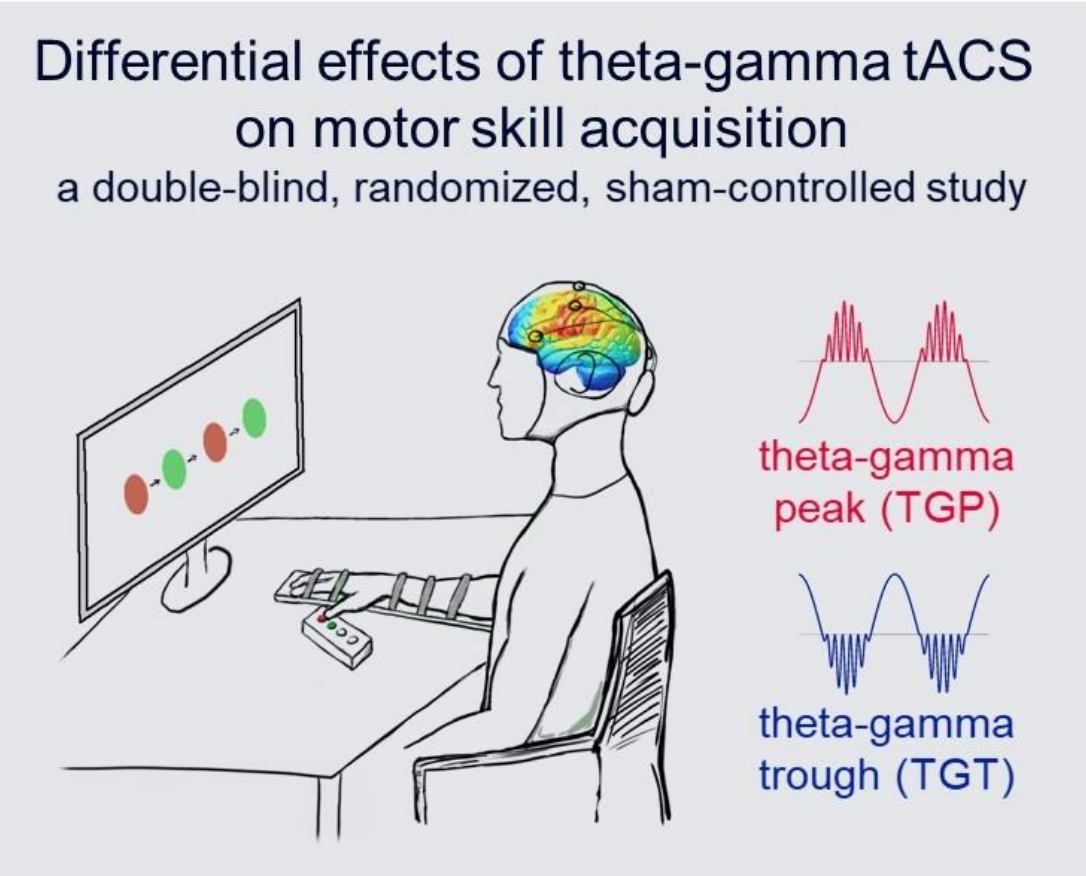
Deep brain stimulation (DBS)

Transcranial alternating current stimulation (tACS)

- Weak E-fields in cortex
- Mechanism partly understood
- State-of-the art: weak E-fields synchronize

  or desynchronize neural activity

Transcranial alternating current stimulation (tACS)

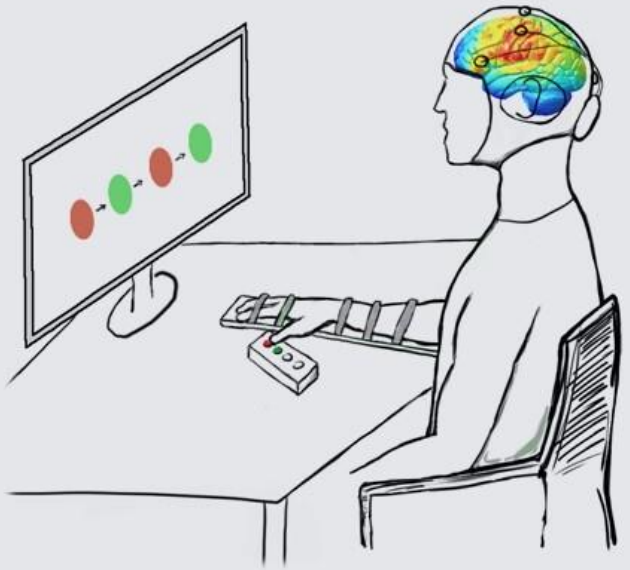


Grigutsch et al, Brain Stimulation, 2024

Transcranial alternating current stimulation (tACS)

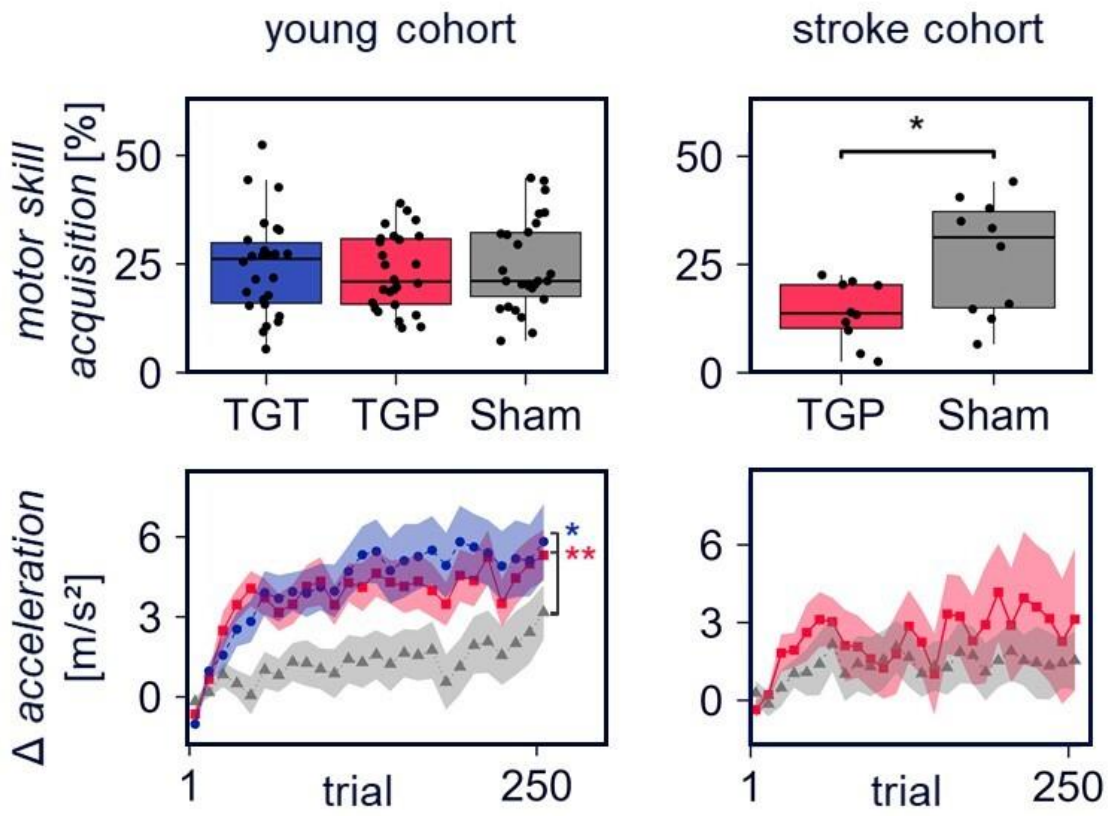
Differential effects of theta-gamma tACS on motor skill acquisition

a double-blind, randomized, sham-controlled study



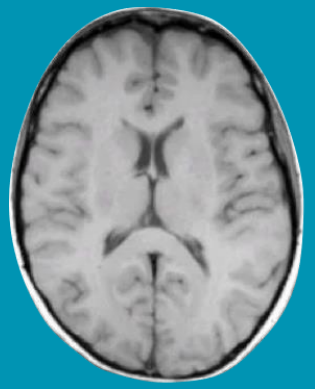
theta-gamma peak (TGP)

theta-gamma trough (TGT)

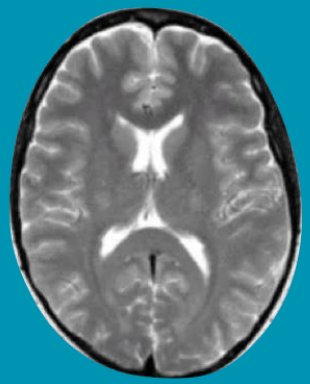


Grigutsch et al, Brain Stimulation, 2024

Personalized E-fields based on MRI

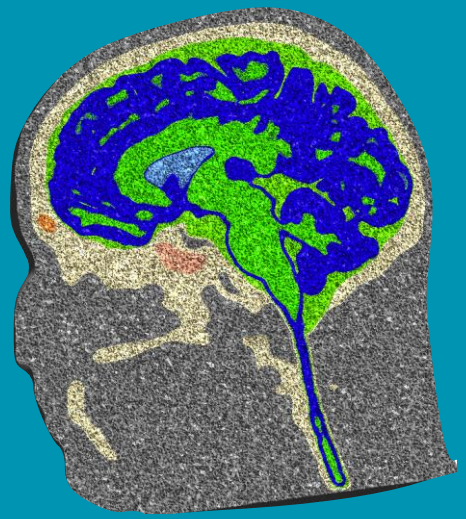


T1w MRI



T2w MRI

Segmentation



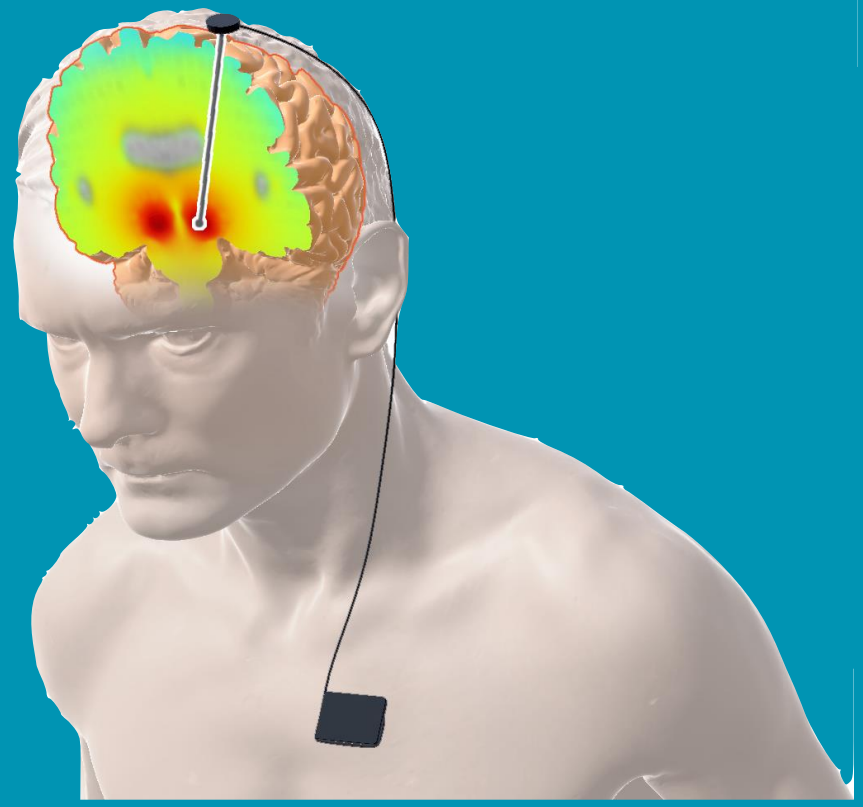
Head mesh

FEM model

E-field

Deep brain stimulation (DBS)

- Strong E-fields in deep structures
- Mechanism still unknown
- State-of-the art: strong E-fields are driving the effect

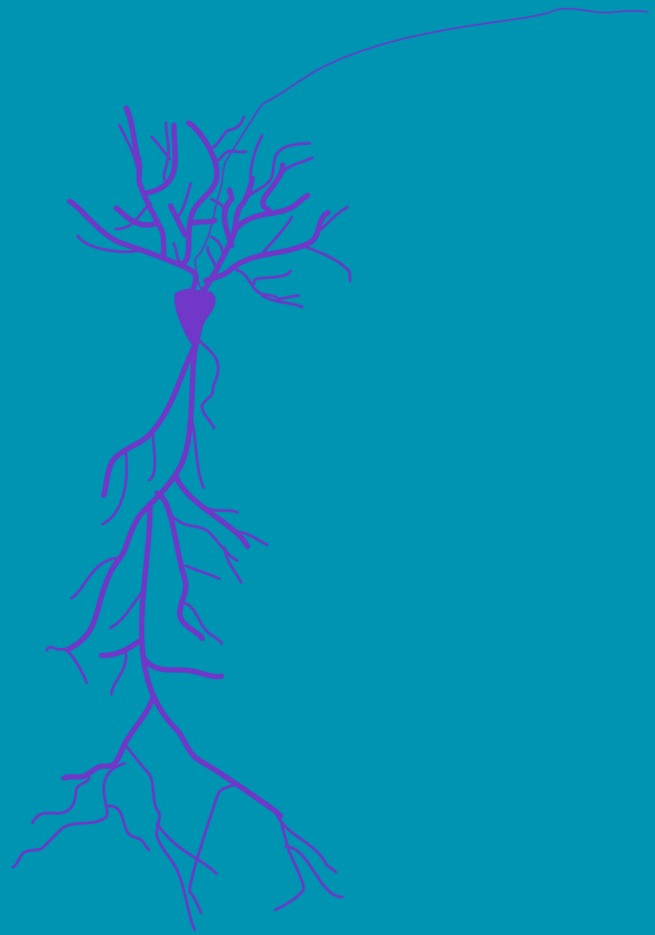


DECODE

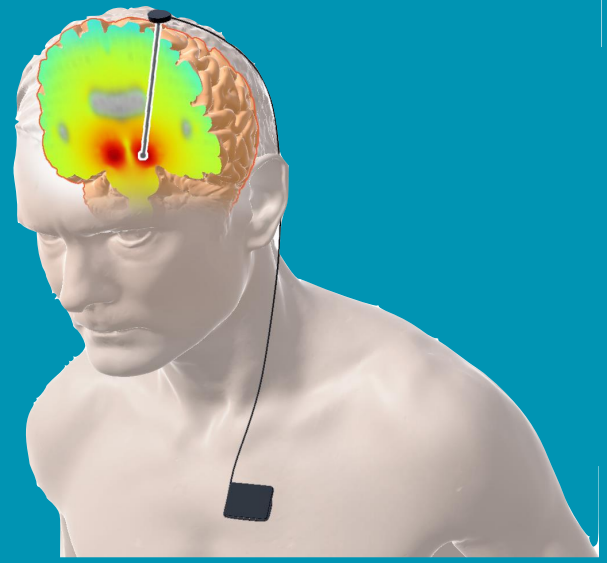
- Weak cortical E-fields have never been studied
- Weak cortical E-fields of tACS are known to desynchronize neural activity
- Desynchronization is important in several neurological conditions, including Parkinson's

DECODE

E-field simulation/optimization

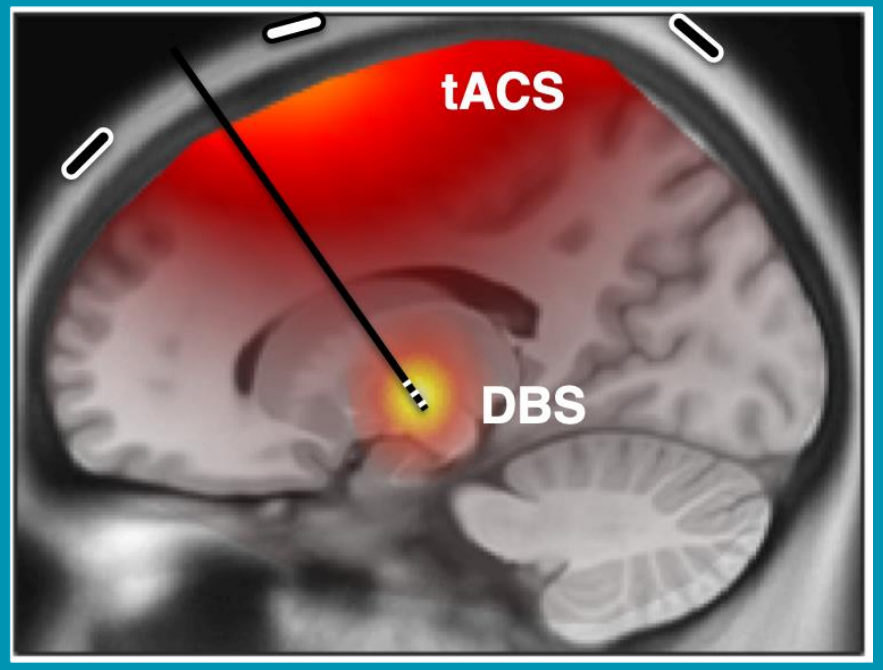


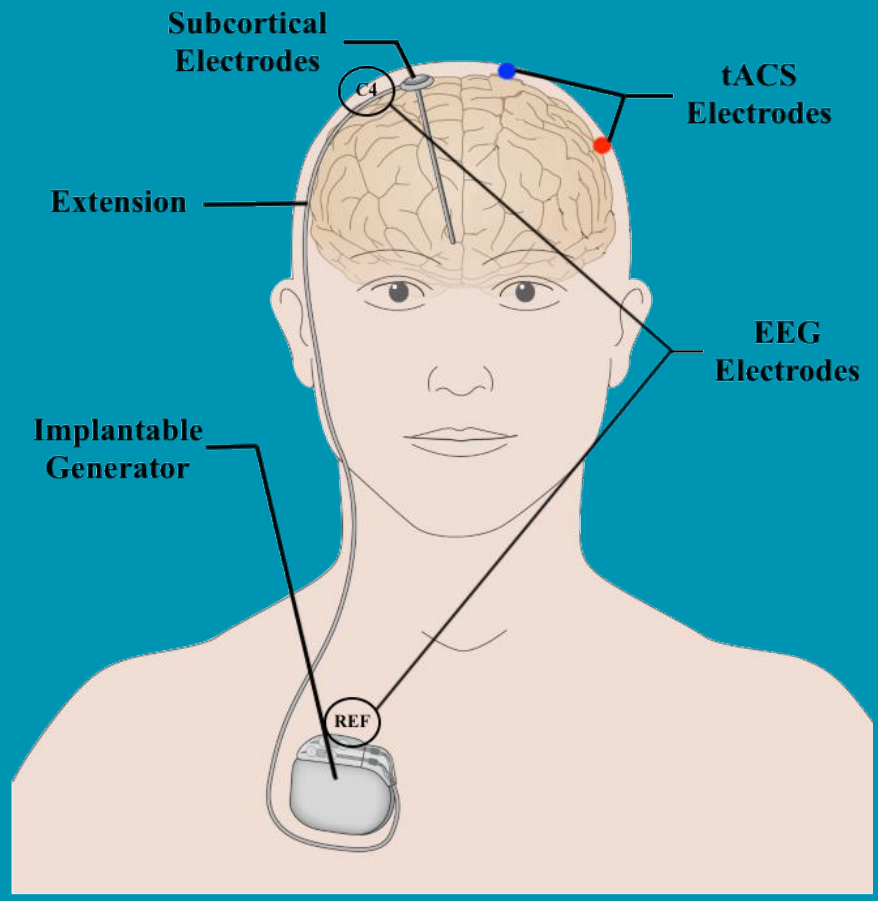
Neural dynamics



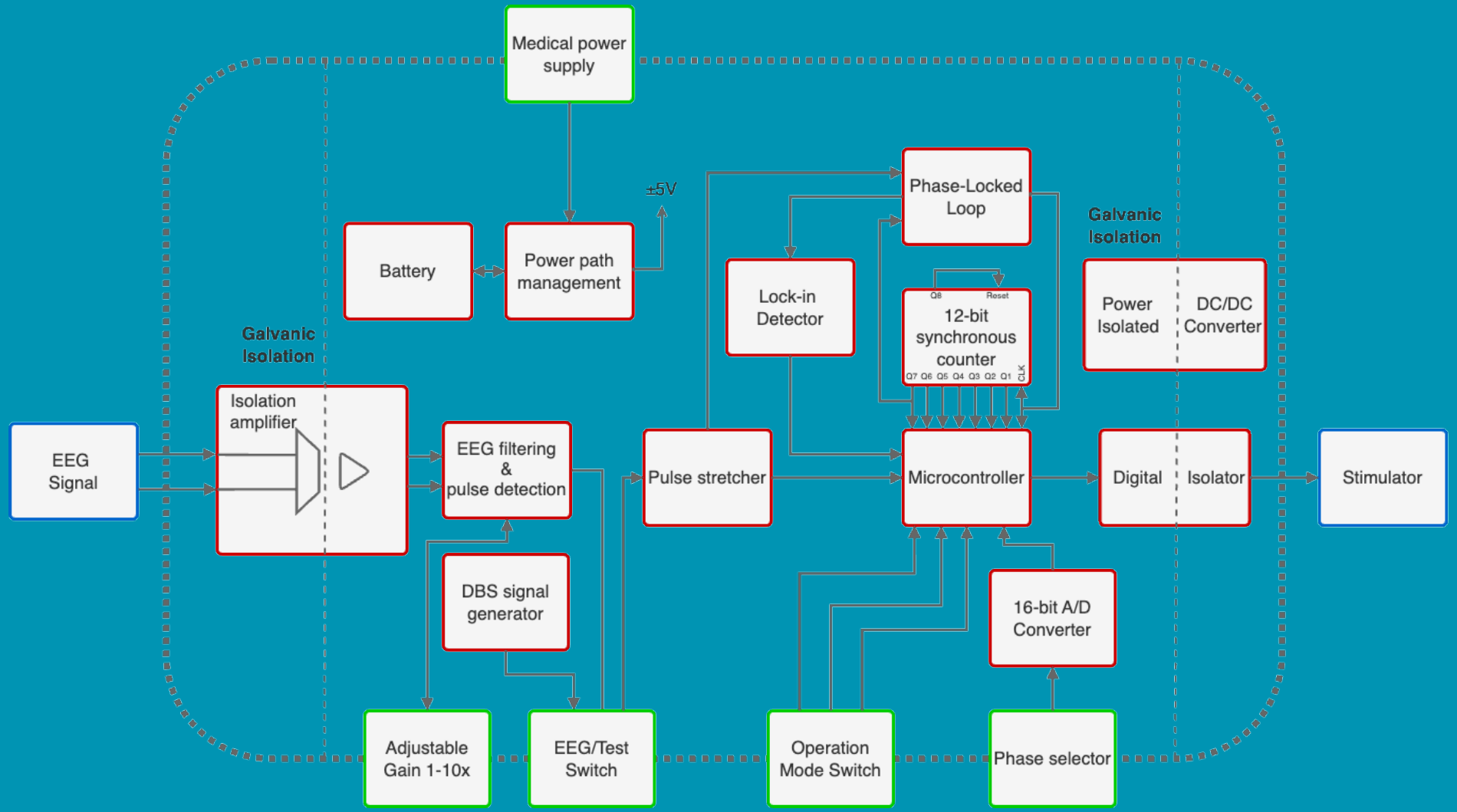
Clinical validation

Combining tACS and DBS in a brain-computer interface





Combining tACS and DBS in a brain-computer interface



Combining tACS and DBS in a brain-computer interface

Brain Stimulation Team

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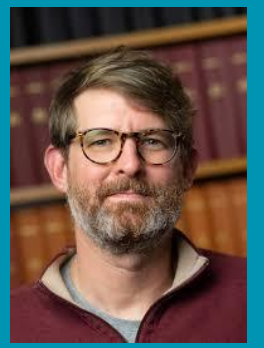
Collaborators





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BRIDGING PAST AND FUTURE: FIVE YEARS OF MEDTECH ADVANCEMENTS AND BEYOND