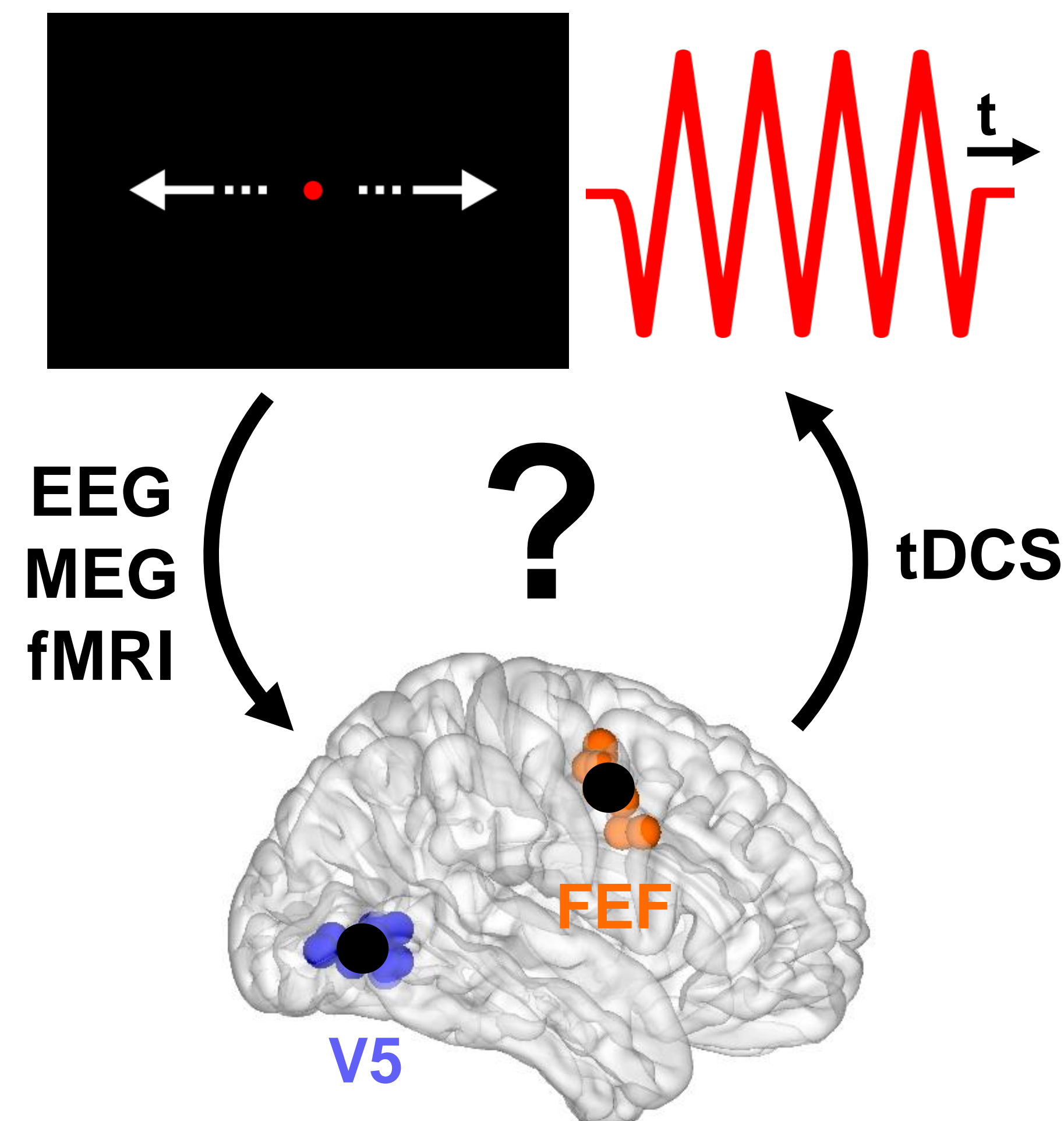


Background

- Activity in area V5 and frontal eye fields (FEF) correlates with the processing of smooth pursuit eye movement [1,2]
- Transcranial direct current stimulation (tDCS) is able to causally modulate neural activity and behavior, but suffers from low reproducibility [3] due to individual variability
- Personalized tDCS can account for individual brain structure and function [4]

→ We present a pipeline for personalized tDCS targeting individual V5 and FEF for the modulation of smooth pursuit eye movement

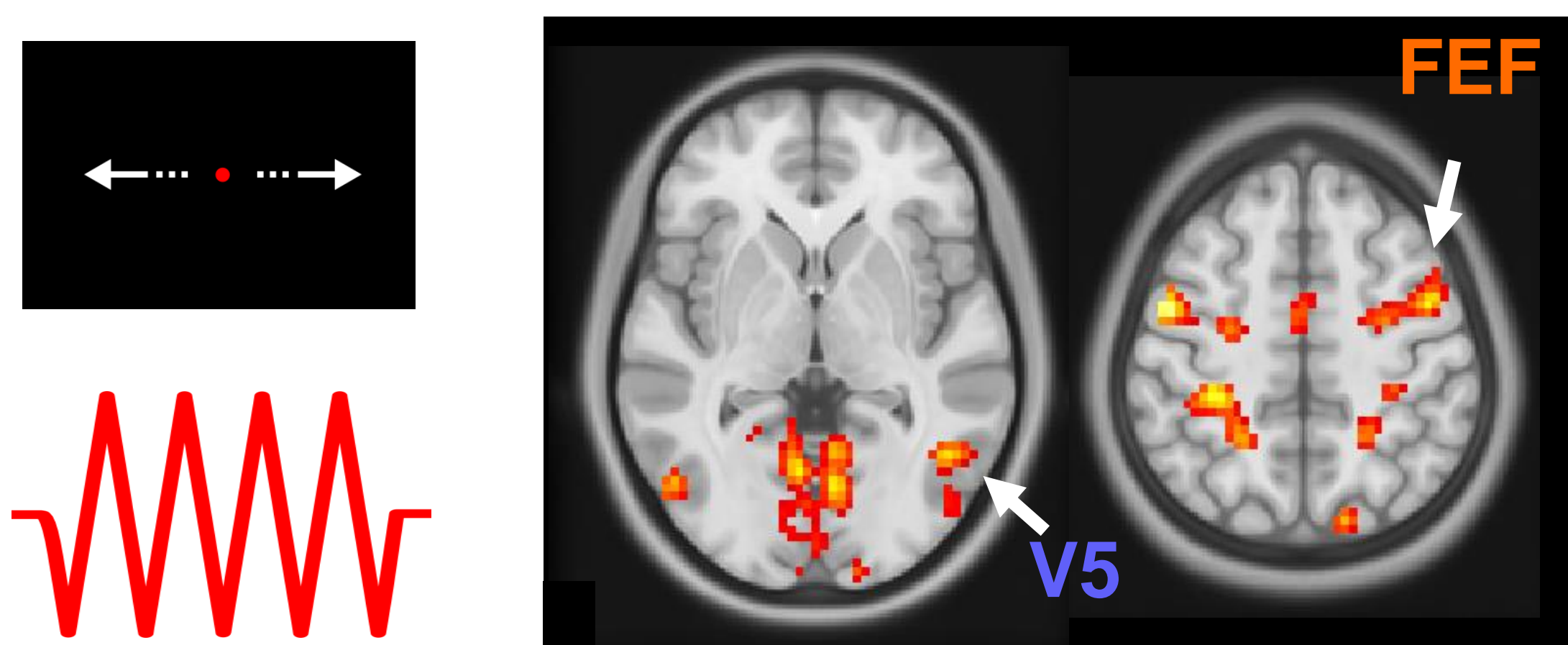
Horizontal eye movement



Methods

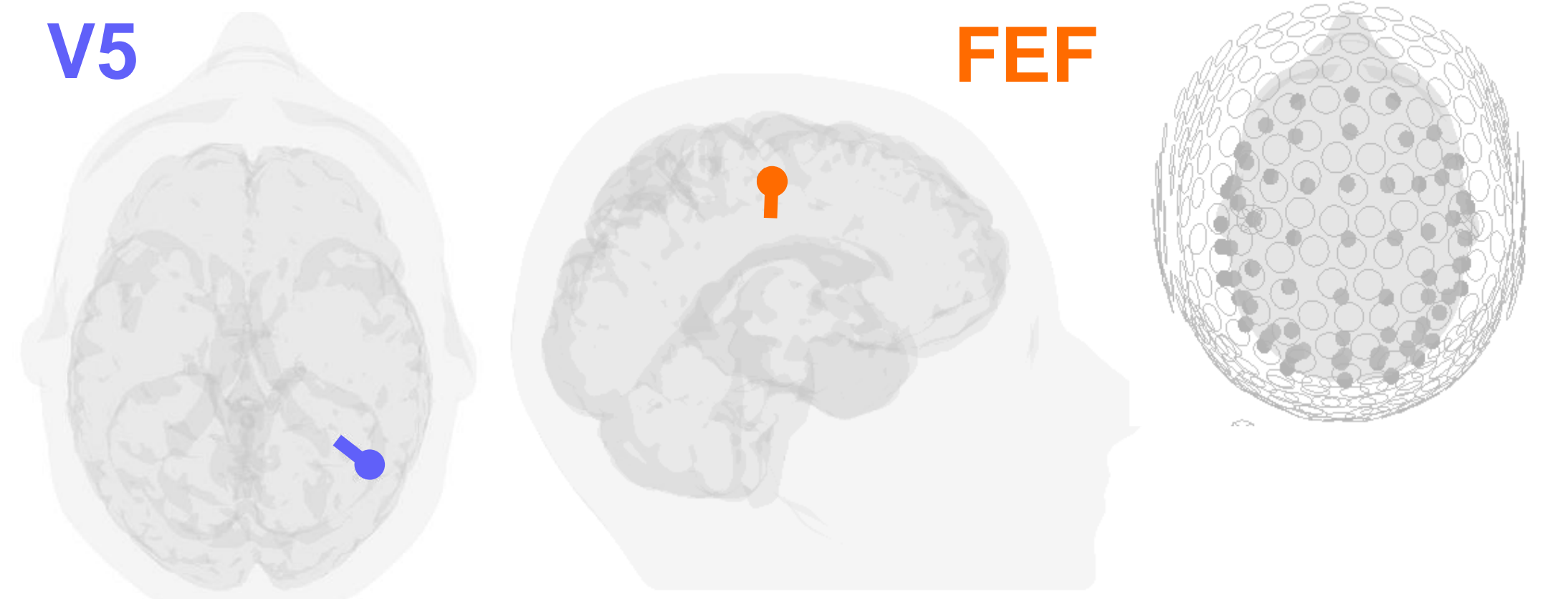
- V5/FEF stimulation targets are defined based on fMRI and combined EEG/MEG measurements
- Individual state-of-the-art headmodels are computed (T1, T2 and DTI)
- Skull conductivity is calibrated using somatosensory evoked activity from combined EEG/MEG recordings
- Personalized tDCS montages are optimized for the V5 and FEF stimulation targets using 74 potential sensor positions from a standard EEG layout

Functional MRI



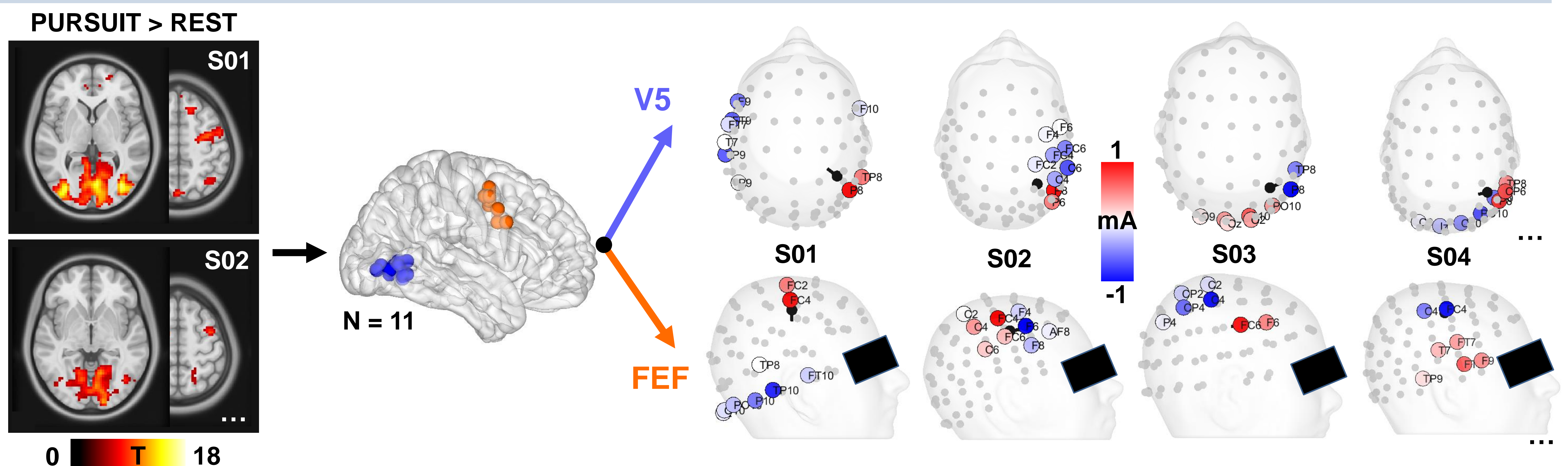
- Define FEF and V5 target **locations** based on fMRI

EEG/MEG

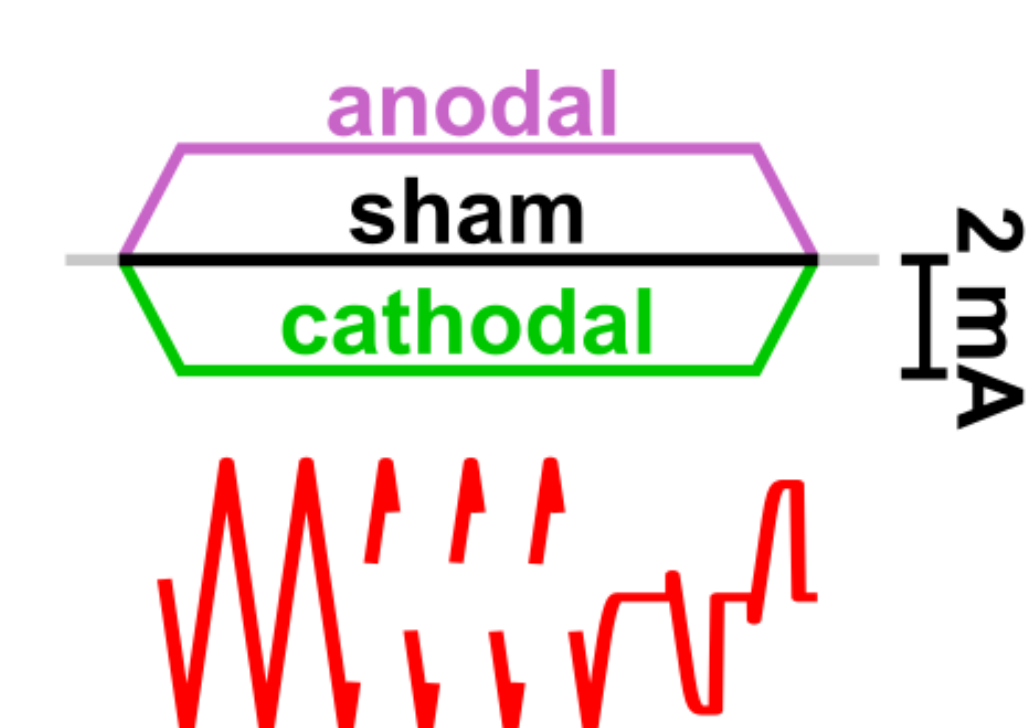


- Define target **orientations** based on EEG/MEG
- See **poster by Buschermöhle et al.** for details

Exemplary stimulation targets and tDCS montages



To be continued: Experimental tDCS design



- Personalized tDCS will be applied in N = 20 participants (20 min., 2 mA)
- Pursuit eye movements will be recorded at t0, during tDCS and for two post-tDCS timepoints
- tDCS is expected to specifically modulate eye velocity, acceleration and pursuit latencies

→ Analyze eye movement data together with electric field simulations and fMRI and EEG/MEG data

References

- [1] Lencer R, Nagel M, Sprenger A, Zapf S, Erdmann C, Heide W, et al. Cortical mechanisms of smooth pursuit eye movements with target blanking. An fMRI study. *European Journal of Neuroscience* 2004;19:1430–6. <https://doi.org/10.1111/j.1460-9568.2004.03229.x>. [2] Ohlendorf S, Sprenger A, Speck O, Glauche V, Haller S, Kimmig H. Visual motion, eye motion, and relative motion: A parametric fMRI study of functional specializations of smooth pursuit eye movement network areas. *J Vis* 2010;10:21–21. <https://doi.org/10.1167/10.14.21>. [3] Wiethoff S, Hamada M, Rothwell JC. Variability in response to transcranial direct current stimulation of the motor cortex. *Brain Stimul* 2014;7:468–75. <https://doi.org/10.1016/j.brs.2014.02.003>. [4] Radecke J-O, Khan A, Engel AK, Wolters CH, Schneider TR. Individual Targeting Increases Control Over Inter-Individual Variability in Simulated Transcranial Electric Fields. *IEEE Access* 2020;8:182610–24. <https://doi.org/10.1109/ACCESS.2020.3028618>.