

EEG-fMRI STUDY OF CORTICAL AND SUBCORTICAL BRAIN NETWORKS

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The aim of the study is to use the EEG-fMRI technique to study the time dependencies occurring in the brain during rest or sensory stimulation. The use of the simultaneous EEG - fMRI recording will enable the measurement of neural activity at two levels of time resolution: in the millisecond scale in the EEG and in the second scale in fMRI (blood-oxygenation level dependent – BOLD). This creates the possibility of analyzing dynamics in neural connections networks and determining activation maps during spontaneous events detected in the EEG recordings. Generalized epilepsy discharges alter the resting pattern of hemodynamic activity of the brain and interfere with functional connections between important brain structures such as the thalamus, visual and prefrontal cortex, and cause hypoperfusion of other regions of the brain.

The study can find its application in the imaging of hemodynamic relationships related to the electrical activity of the cerebral cortex. This applies in particular to disorders and diseases of the nervous system, including epilepsy. Thanks to the high spatial resolution of fMRI and high EEG time resolution it will be possible to locate epileptic foci during epilepsy discharges.

The work will consist of software implementation (MATLAB) for combined EEG - fMRI analysis. The proposed method should enable determination of hemodynamic parameters of the BOLD signal in selected brain areas.