



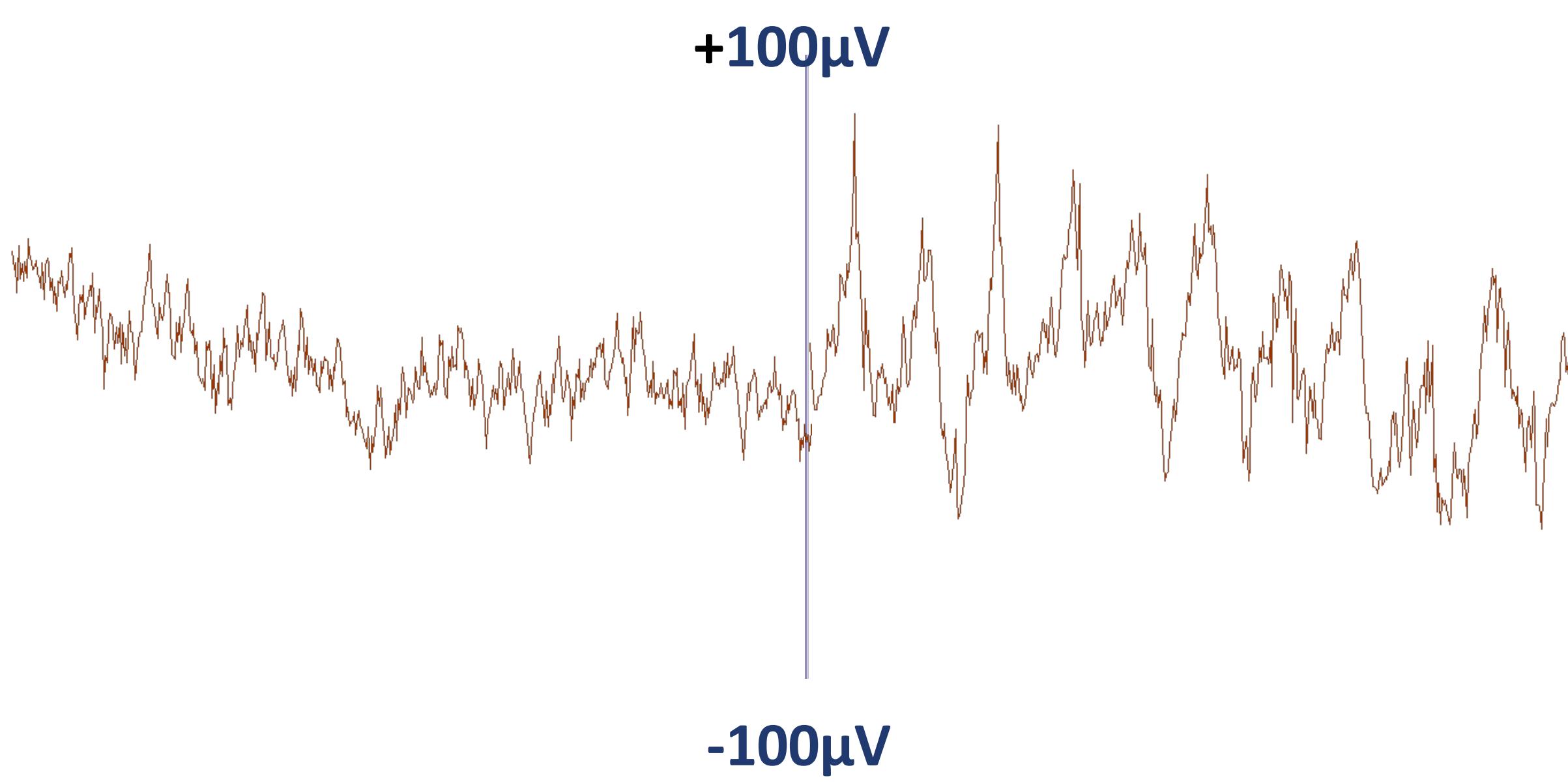
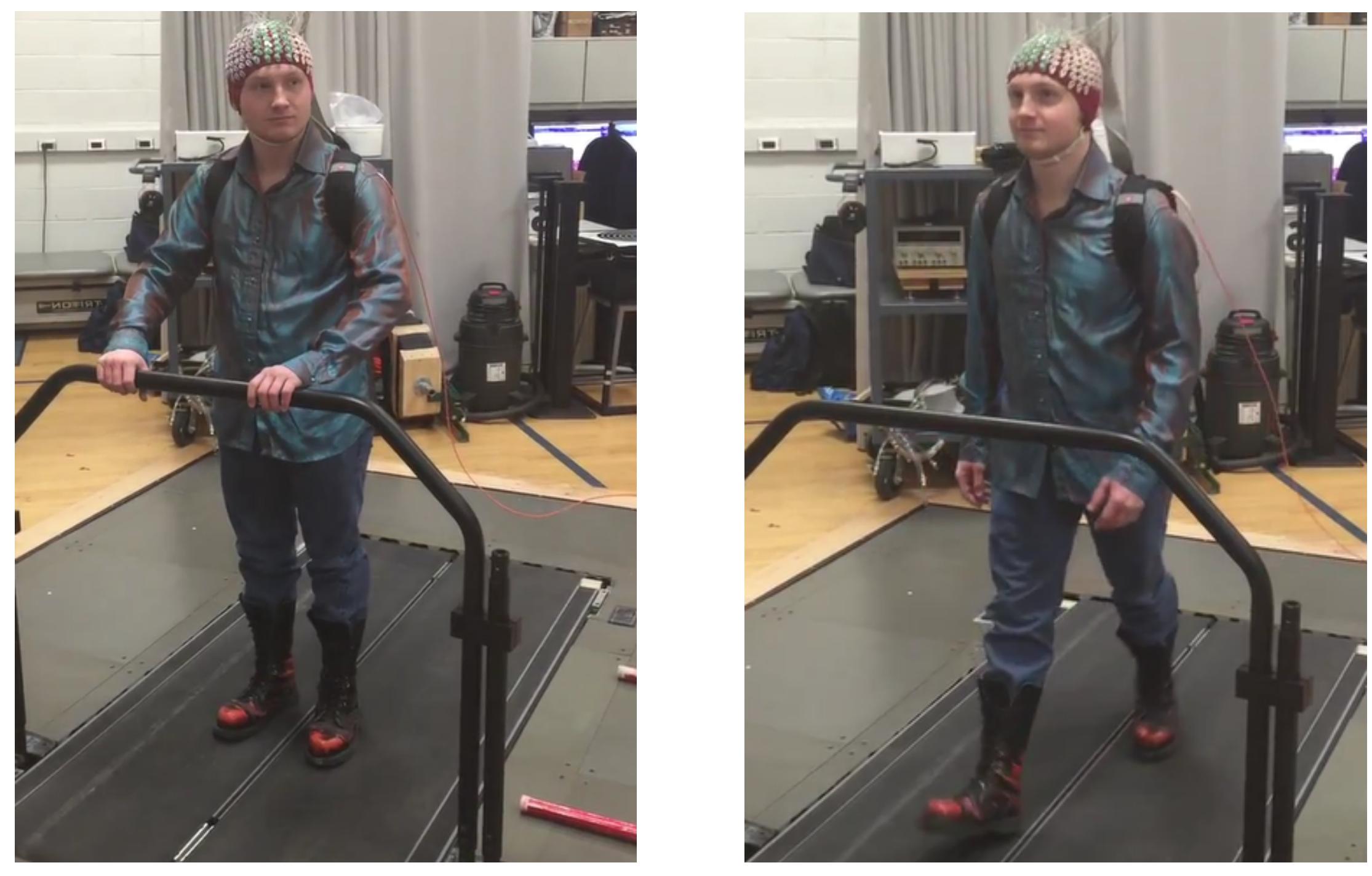
An EEG Acquisition Kit with Motion-Artifact Noise Cancellation

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INTRODUCTION

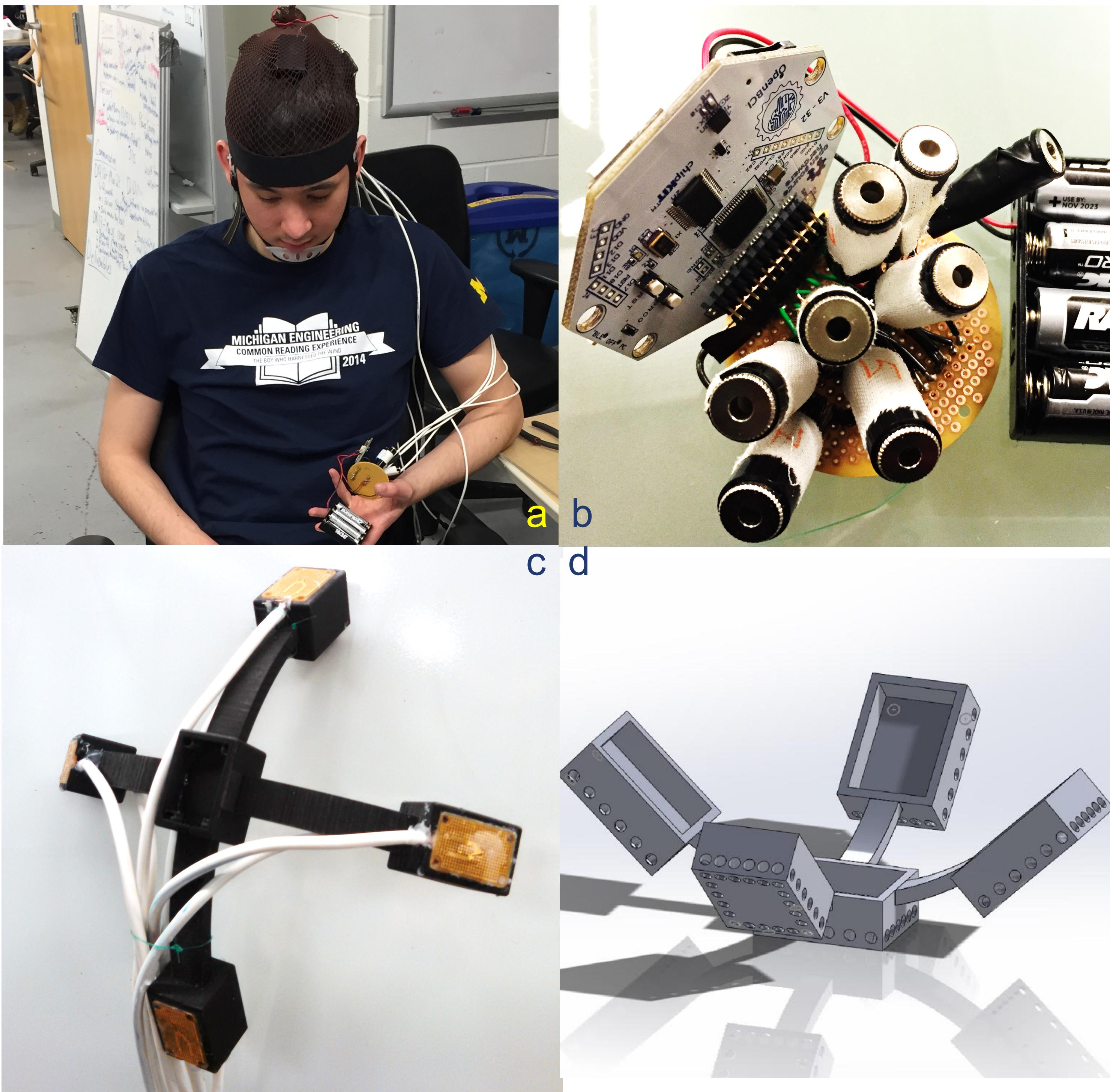
EEG (Encephalography): A non-invasive measure of brain signals along the scalp

Problem: EEG cannot be used in motive studies due to the presence of motion artifacts

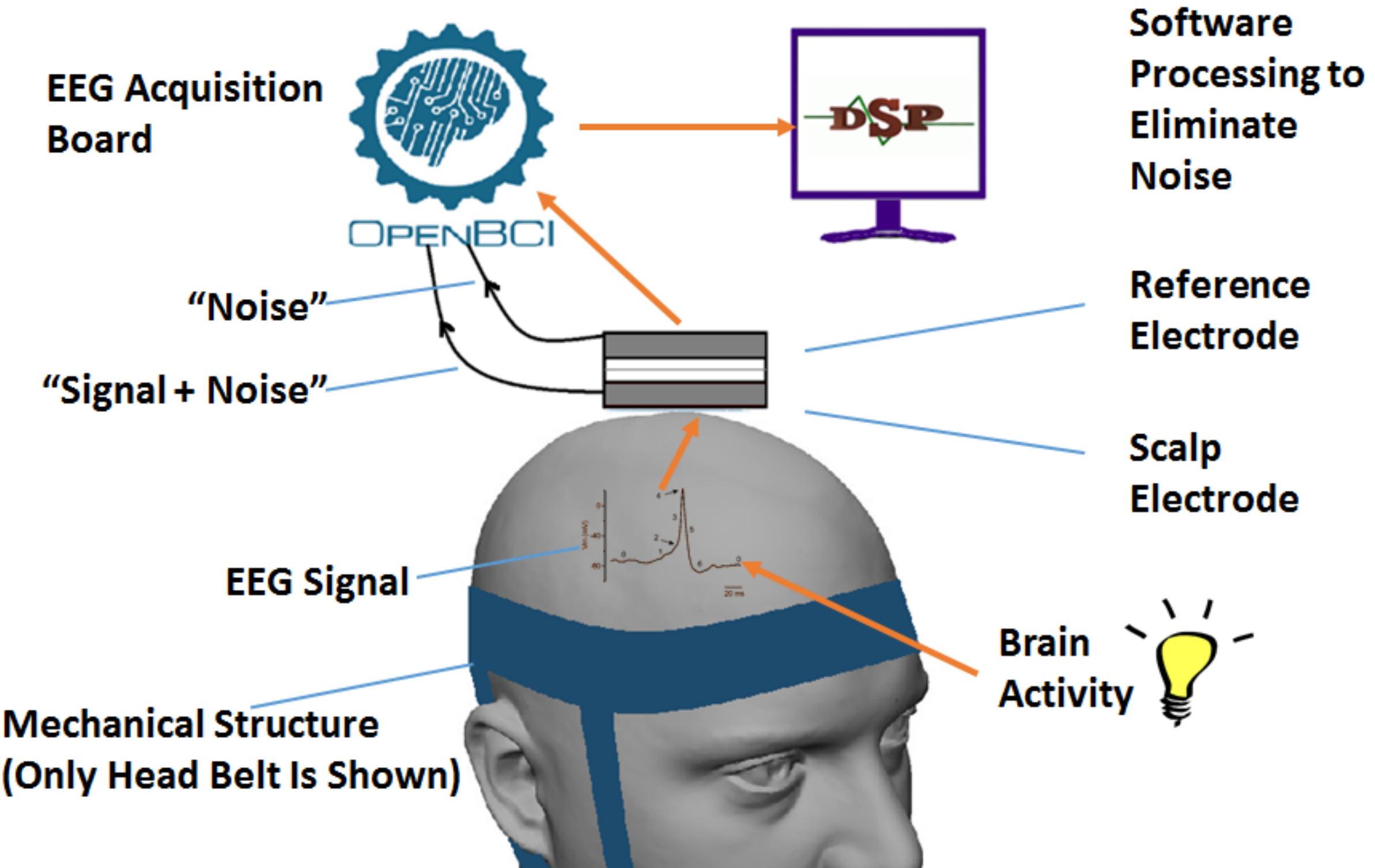


Motion Artifact Absent Motion Artifact Present

DESIGN



(a) Whole System (b) Hardware System
(c) Electrode Connector (d) Electrode Caps (Agar Gel Holder)



DESIGN CONCEPT

The main idea of the system is based on differential signal acquisition:

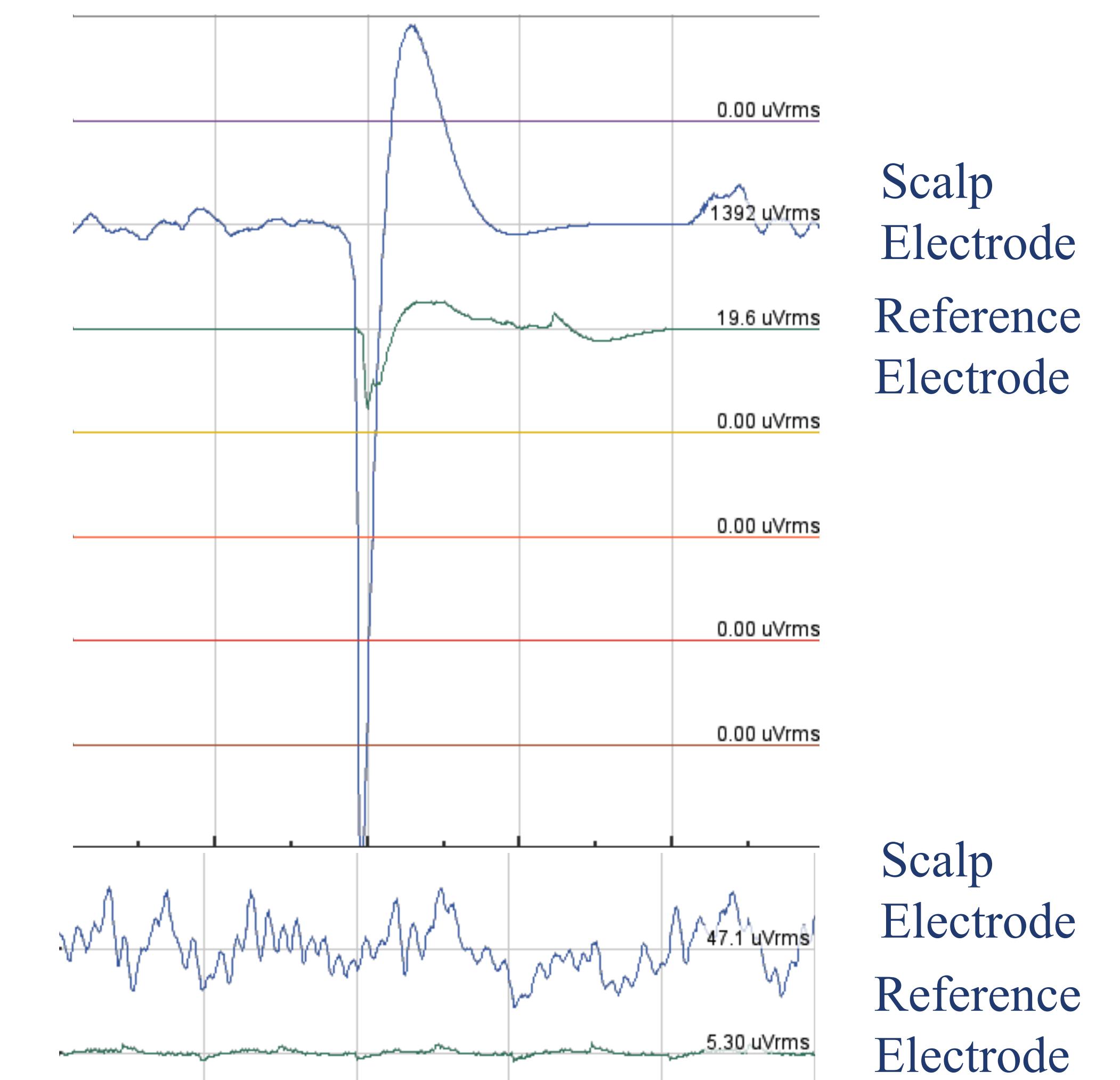
- The scalp electrode will be in contact with scalp and collect the sum of EEG signal and motion artifacts;
- The reference electrode will be in contact with a conductive agar gel and collect motion artifacts only;
- The signal acquisition system (OpenBCI board) collects signals from both electrodes and send it to the computer wirelessly;
- The computer computes the relative ratio of the amplitude of motion artifacts and perform subtraction;
- The mechanical structure provides stability for the system and hold the system together.

KEY DESIGN REQUIREMENTS

Criteria	Specification	Current System
Signal-to-Noise Ratio	>30 dB (calm) >10 db (motive)	
Frequency of EEG Spectrum	0.1 – 63 Hz	0 – 128 Hz
Guaranteed Movement Area	>1 m Radius	>10 m
Wire Robustness	>500 90° flexes	>500
Setup time	<25min	Not tested
Conductance of Conductive Layer	0.33-0.45 S/m	0.08-0.20 S/m

VALIDATION

We are currently in the process of validating our key design requirements. We have just finished validating the feasibility of the main concept (i.e. performing motion-artifact noise cancellation by differential acquisition).



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