# Multipurpose Event Synchronization Device for EEG Research and Brain Computer Interface Applications

## Development status

**Clinical trials**

## IP protection status

N/A

## Partnering strategy

*Collaboration, investment, licensing*

## Institution

NÁRODNÍ ÚSTAV DUŠEVNÍHO ZDRAVÍ

**National Institute of Mental Health**

## Challenge

Precise synchronization of real-world events like sounds, visual stimuli, or subject responses with EEG recording is a well-known problem across EEG laboratories around the world. This problem is usually faced by an inhouse software or hardware solutions. For example, precise timing and reduction of latency jitter is a common issue in neuro-research. Almost every event related potential (ERP) study or simple ERP deal with time precision of each stimulus. Most of the solutions use post-process time latency estimation based on computing methods or on calibration measures. To the best of our knowledge, there is no device capable of all above mentioned applications available for scientific or industry users on the market. The main goal is to develop, test, and validate a high precision device capable of synchronizing hdEEG, wearable EEG, EYETRACKing, fMRI, and all Lab Streaming Layer (LSL) compatible devices with real world signals and events.

## Description

Multi-purpose input/output circuits for synchronizing time events such as visual stimulation, audio stimulation or precise time registration of pushed buttons will be involved in the device. Extending sensors will be available via a standard TTL logic or analogue input interface. The device will be made of two layers, the first layer is considered to be a hardware core layer, which will consist of ARM microprocessor to ensure speed and time precision of events using interrupt routines. The second layer will be a mini computer based interface with an operating system for easy user access. This solution will also allow users to configure synchronization options. Finally, this device will be designed to synchronize time-related events with EEG and all other connected devices and will be independent of any stimulation or recording platform. The core properties of the new device will be: ● Lab Streaming Layer compatible interface ● 3T MRI scanner

compatibility ● User interface based on touchscreen and configurable profiles ● cross-platform design, TTL outputs for LSL incompatible devices ● validation for event related potential (ERP) based applications ● tested on laboratory and wearable EEG devices The idea lies in building the device on the basis of the Lab Streaming Layer (LSL), which is freely available and tested software across many EEG, EYETRACKING, human interface, and motion capture devices. Standard TTL output signals will be available for LSL incompatible devices. *hdEEG = high density electroencephalography *TTL = transistor-transistor logic

## Commercial opportunity

Generally, our multi-purpose platform will be suitable for brain research, behavioural experiments, brain computer-interface applications, telemedicine, road traffic safety, and other EEG related industry applications. Thanks to easy user access with smart graphical user interface we expect applications also in sport and entertainment. The synchronization device will be also MRI compatible due to its design based on network access. Compared to other devices, our system will be further fully platform independent, developer friendly and extendible for more applications.