PATENT

CENTRO DE INVESTIGACIÓN BIOMÉDICA EN RED

NEURAL PROBE RECORDING FULL FREQUENCY SPECTRUM OF BRAIN SIGNALS

The Need

Recording the full frequency spectrum of brain signals. Currently utilized neural probes are unable to detect infraslow (<0.1Hz) brain activity, limiting their application in certain neurological disorders whose biomarkers demonstrate themselves in infraslow frequencies. It is of a critical importance to improve this technology to treat these diseases.

The Solution

The present invention provides a stimulation and recording flexible neural probe capable of recording full frequency spectrum of brain signals, and use this information to trigger and/or control and/or adjust applied brain stimulation, e.g. in a closed-loop fashion. Thanks to the ability to detect infraslow (<0.1Hz) brain activity, the neural probe of the invention can be used for treatment of a wide range of pathologies, including those neurological disorders whose biomarkers demonstrate themselves in infraslow frequencies.

Innovative Aspects

The main novelties of this invention and the differences in comparison to the state-of-the-art are:

1) It avoids drift and signal attenuation (observed in metal-based recording electrodes) enabling recording of brain activity in the full frequency spectrum, in particular, infraslow frequency range.

2) This invention incorporates stimulating electrodes with high-charge injection capacity to provide safe and efficient tissue stimulation.

3) It offers the closed-loop functionality by combining brain stimulation and recording capabilities. If the biomarker is detected, recorded with transistors neural activity serves as a trigger for stimulation protocol executed with electrodes. Because of the unique ability to record full spectrum of brain activity, this invention is the first closed-loop system that takes advantage of the biomarkers hidden in the infraslow activity range. Therefore the system will be more effective for multiple therapies and even might be the only possible choice for patients with certain neurological disorders like epilepsy or stroke.

4) Additionally, the inherent multiplexing properties of the transistors embedded into a hybrid array has the potential for high-density recordings, unobtainable using unimodal electrode-based configurations. Finally, the robustness of transistors to stimulation artifact make them a proficient choice for simultaneous recording and stimulation.

Stage of Development: Prototype validation

Intellectual Property

European patent application (Priority date: October 9, 2024)

Suitable for international extension (PCT application)

Available for:

- **Licensing**
- **Further development**

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