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CHARGE STEERING HIGH DENSITY ELECTRODE ARRAY FOR DEEP BRAIN STIMULATION

MEDICAL DEVICES

Electrode array for deep brain stimulation that increases treatment efficacy and reduces complications by facilitating effective targeting on the first insertion.

TECHNOLOGY TYPE

Class III
Nanotechnology
MEMS/NEMS

STAGE OF DEVELOPMENT

- Proof of concept established through simulations.

- Animal model prototypes in development.

IP PROTECTION

Nationalized PCT Issued in the United States

Charge Steering High Density Electrode Array
US10124160B2

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Reference Number: U-5123

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TECHNOLOGY SUMMARY

Deep brain stimulation (DBS) has therapeutic benefits for neurological disorders, such as Parkinson's disease, tremors, chronic pain, and dystonia. Existing DBS solutions utilize four-channel electrodes that only allow spherical charge distributions. This lack of targeting capability results in placement errors, with three to five insertions typically required for correct placement.

A new electrode array with enhanced circuitry enhances targeting and improves stimulation by enabling successful stimulation in spite of placement errors. The array uses a silicon backbone and seven wires for full control over an unlimited number of electrode contacts. The stimulation parameters can be controlled based on the neuroanatomical target by switching between contacts, facilitating effective DBS on the first insertion of the array into the brain. The high number of small contacts on the surface also allows nuanced control over the amount of tissue being excited.

FEATURES AND BENEFITS

- Enables better penetration of brain tissue and enhanced targeting for structures deep within the brain.
- Activates neurons with hundred-micron spatial resolution.
- Accommodates millimeter scale errors in surgical targeting through voltage shaping.

RECENT PUBLICATIONS

Anderson, D.N., Osting, B., Vorwerk, J., Dorval, A.D., Butson, C.R. (2018). Optimized programming algorithm for cylindrical and directional deep brain stimulation electrodes. *Journal of Neural Engineering.* 15(2): 026005. doi: 10.1088/1741-2552/aaa14b

Willsie, A., Dorval, A. (2015). Fabrication and initial testing of the µDBS: A novel deep brain stimulation electrode with thousands of individually controllable contacts. *Biomedical Microdevices.* 17(3): 9961. doi: 10.1007/s10544-015-9961-x

INVENTOR PROFILE

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