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Conformable Dual-mode Ultrasound Transducers for Neuromodulation

Technology No. 20170154

IP Status: Pending US Patent; **Application #:** 16/376,139

Non-invasive tFUS Neuromodulation Patch

A site-specific patch, which attaches to the skin like an adhesive bandage, offers non-invasive transcranial focused ultrasound (tFUS) neuromodulation via dual-mode ultrasound array (DMUA) transducers. The DMUA transducer patch features lightweight transducers with a low-profile, layered structure of a 3D-printed lens (based on the treatment target and surface topography), thin polymer piezoelectric transmitting-receiving elements and a thin backing material (i.e., alumina or flexible circuit boards). A low power driving circuit is driven by a battery-powered handheld device. The patient-specific design and the 3D printed lens allow this device to target specific volume within the brain or other neural targets like DBS, but without having to drill a hole in the patient's skull.

Targets Multiple Volumes, Minimizes Number of Elements

Transcranial focused ultrasound (tFUS) neuromodulation shows promise as a noninvasive modality with a high degree of spatiotemporal control, but such spatial control often requires hundreds or even thousands of transducer elements, significantly limiting tFUS use to hospital settings. This patch design offers the highest level of spatial precision possible while requiring very low channel count, eliminating the need for a bulky driver for hundreds of array elements. The patch can also be targeted to multiple volumes and allows for minimization of the number of elements to only a few elements (as opposed to hundreds or thousands).

BENEFITS AND FEATURES:

- Non-invasive transcranial focused ultrasound (tFUS) neuromodulation via dual-mode ultrasound array (DMUA) transducers
- Patch attaches to the skin like an adhesive bandage
- Non-invasive alternative to DBS; no drilling of skull required
- Low profile (~2 - 3 mm thick) layered structure

- 3D-printed lens based on the treatment target and surface topography
- Thin polymer piezoelectric transmitting-receiving elements
- Thin backing material
- Low power driving circuit needed

APPLICATIONS:

- Neuromodulation
- DBS applications
- Transcranial focused ultrasound (tFUS) neuromodulation
- May prove applicable to a range of diseases and brain conditions

Phase of Development – technology is ready for testing

Researchers

Emad S Ebbini, PhD
Professor, Department of Electrical and Computer Engineering
External Link (ece.umn.edu)

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