

# Noninvasive brain stimulation with ultrasound to treat neurological disorders

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## Technology description

### Summary

Brain stimulation techniques are used to treat a variety of neurological and psychiatric disorders, including chronic pain, Parkinson's disease, depression, and essential tremor. However, surgical electrode implantation is often used because currently available noninvasive techniques suffer from poor spatial resolution or inadequate tissue depth penetration. This technology uses an ultrasound apparatus and custom software to stimulate specific intracranial nerves via noninvasive ultrasound. The brain modulation capability enabled by this system has the potential to not only help with the treatment of neurological disorders, but also to improve brain mapping.

## Controlled ultrasound for noninvasive stimulation of the brain using standard equipment

This technology achieves the difficult goal of high-resolution, noninvasive brain stimulation by employing focused ultrasound. Custom software allows precise control of location and ultrasound parameters. The setup allows for targeting of specific, deep regions in the brain at high resolution, without the need for surgery or anesthesia. Additionally, this technique can be used in tandem with high-intensity focused ultrasound (HIFU) to provide increased target specific while avoiding sensory regions of the brain.

A prototype of this technology, using standard computer and ultrasound equipment, has shown millimeter-range resolution in mice.

## Application area

Treatment of neurological or psychiatric disorders, such as chronic pain, Parkinson' s disease, depression, and essential tremor

Research on specific brain areas and their related disorders

Noninvasive brain mapping

## Advantages

Noninvasive compared to deep brain stimulation

Accesses deeper, more specific brain structures than electrical convulsive therapy and transcranial magnetic stimulation

Setup involves standard equipment

No surgery or anesthesia required

Compatible with HIFU for more targeted treatment

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