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# ACTIVATION OF NEURAL TISSUE BY FUS IN THE PRESENCE OF A MAGNETIC FIELD GRADIENT

Tech ID: 34303 / UC Case 2026-046-0

#### PATENT STATUS

Patent Pending

#### **BRIEF DESCRIPTION**

Transcranial focused ultrasound stimulation (TFUS) is a neuromodulation method that aims to change nervous tissue activity non-invasively.

TFUS may be applied in an MRI scanner using image-based navigation. There is evidence in animals that the presence of a magnetic field may change the effects of TFUS on brain activity, presumably via Lorentz force effects. The evidence for any such effect in humans is weak and it is usually assumed that the MRI magnetic field does not alter the action of the TFUS.

UC investigators provide a new method, Faraday induction-enhanced Focused Ultrasound Stimulation (FIEFUS), of applying ultrasound to nervous tissue (central or peripheral) by utilizing the strong, fringe magnetic field gradients found outside an MRI scanner. The concept is based on the theoretical generation of substantial electromagnetic induction from ultrasound-induced motions within the strong static magnetic field gradient, which could then be used to affect nervous tissue activity. This approach is motivated by the observation that a static, homogeneous magnetic fieldmayalter TFUS effects in animals—possibly through Lorentz forces—suggesting a strong magnetic field gradient could be a controllable experimental variable to induce circulating electric fields localized to an ultrasound target region.

## SUGGESTED USES

The primary suggested use is as a new method to perform ultrasound neuromodulation in the peripheral or central nervous systems.

Specifically, the generated electromagnetic induction could be employed to enhance or separately activate nervous tissue beyond the mechanical effects of the ultrasound alone.

## **ADVANTAGES**

- » Enhanced/Separated Activation: The potential to generate localized circulating electric fields could provide a new physical mechanism to enhance or separately modulate nervous tissue compared to standard TFUS.
- » Variable Control: It introduces the strong stray magnetic field gradient as a controllable experimental variable in TFUS application.
- » Novel TFUS Method: It opens up a new pathway for non-invasive neuromodulation using focused ultrasound and existing MRI infrastructure.

## **RELATED MATERIALS**

### CONTACT

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## **INVENTORS**

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#### OTHER INFORMATION

#### **KEYWORDS**

brain, neuromodulation, ultrasound, electric field, magnetic field gradient

## **CATEGORIZED AS**

- » Biotechnology
  - >> Health
- » Medical
  - » Therapeutics

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