NEUROLUX

WIRELESS OPTOGENETICS

NeuroLux

The NeuroLux system provides ultra-lightweight, minimally invasive implants that do not rely on external antennas, batteries, fiber optic cables, or mounts. These features allow subjects to move naturally as individuals or interact as members of a social group.

With our wireless, battery-free operation, NeuroLux implants have unlimited operational lifetimes and have survived implantation for up to 14 months.

With NeuroLux's user-friendly GUI, researchers can program pulse frequency and duration to meet their study requirements. Multiple colors of μ-LEDs are available for optogenetic stimulation or inhibition. Additionally, our system is compatible with any TTL input for closed-loop behavioral applications.

The NeuroLux platform provides hardware packages that are customizable to meet the needs of any laboratory environment.

Contact us today to integrate our wireless NeuroLux system into your experimental design!

info@TSE-Systems.com

OPTOGENETICS STARTER KIT

We provide the full hardware and software system along with every tool necessary to set it up. Don't worry about finding the right cables or screwdrivers; we have you covered!

LAPTOP WITH NEUROLUX SOFTWARE

Researchers can control optogenetic stimulation parameters using NeuroLux's user-friendly software. The intuitive interface allows you to adjust frequency and pulse duration, and to generate burst mode protocols that are compatible with TTL input systems.

Size: 29.5 x 20. x 1cm
Weight: 1.2 kg

POWER DISTRIBUTION CONTROL (PDC) BOX

The PDC Box is responsible for delivering wireless power to the implants. Our wireless operation scheme provides robust coverage in multiple experimental cages and boxes commonly used for rodent behavioral studies. Closed-lidhome cages with food and water containers are fully compatible, largely independent of materials and structures, suitable for studies of individuals or groups of mice. Contact us to learn more about the power transmission and use in your specific enclosures!

Size: 22 x 20 x 26cm
Weight: 1.7 kg

AUTOTUNER BOX

The Autotuner provides fast and accurate tuning capabilities of the NeuroLux antenna, allowing our system to be used in any laboratory environment and operate within various experimental setups, including those with metallic objects and water.

Size: 11 x 11.5 x 9cm
Weight: 0.5 kg

MODULAR SYSTEM

The Modular System allows up to 8 experiments to be run in parallel, increasing experimental throughput. A NeuroLux laptop connects to the host module via ethernet or a Wifi router. The host module then communicates with its own enclosure and each of the other modules. Each module has full control over their individual enclosures, which includes unique pulsing schemes, TTL mode, and burst mode. The modules can be controlled without the need for long cables and even from a different room. The NeuroLux Modular System will be launching commercially in 2022.

PULSING: Modules can deliver stimulation at frequencies between1 and 50 Hz with any given duty cycle

TTL: Each module has a BNC port to connect external triggering devices that will allow closed-loop feedback to guide stimulation timing.

BURST MODE: Enables the power to pulse periodically with given ON and OFF times, ranging from 1 second to 10 minutes. These values are set through the NeuroLux software interface.

HIGHER POWER: Generates up to 12 watts of power to provide consistent power throughout all common animal enclosures and test chambers.

SIZE: 22.5 x 6 x 23 cm (each)

WEIGHT: 1.2 kg (each)

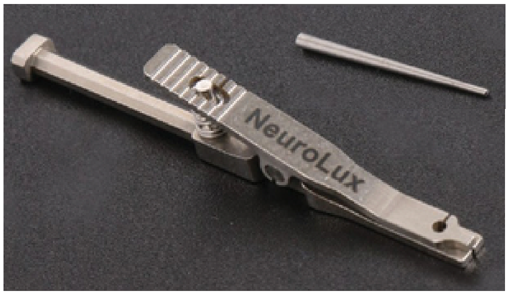
SURGICAL PACKAGE

NeuroLux supplies you with all the necessary tools for successful device implantation. The NeuroLux Mouse Surgical Kit features instruments from FST, including surgical scissors, a scalpel handle, burrs for a micro-drill, mini bulldog serrefines, an Olsen-Hegar Needle Holder with scissors, standard pattern forceps, straight blunt forceps, and curved blunt forceps.

Surgical Kit

Custom Surgical Clip & Pin

The included surgical clip and PH-300 stereotaxic adapter from ASI Instruments allows you to accurately place the probes into a mouse's brain.



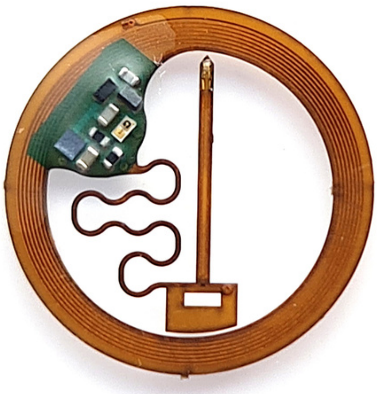
Stereotaxic Adaptor

IMPLANT DEVICES

Our fully implantable devices integrate a flexible magnetic loop antenna for wireless power delivery. The entire device is smaller than a U.S. dime, while the probes are configured for implantation in the brain and spinal cord.

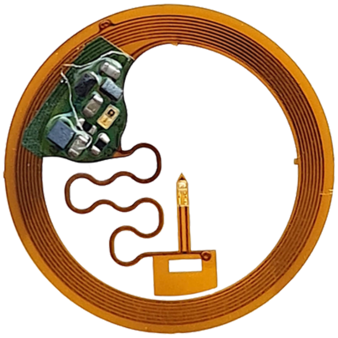
Unilateral Device

The brain implantable device mounts subdermally on top of the animal's skull without external hardware or tethers. These wireless devices allow for months-long experimental stability in operation and have no observable adverse effects on brain tissue, animal movement, or general social behavior. It also incorporates a red indicator μ-LED to provide a convenient indicator of operation.



Size: 10.5 x 1.3 mm (diameter x thickness)
Weight: 30 mg or less
Wavelength: 470 nm (blue), 530 nm (green), 590 nm (yellow), 630 nm (red)

μ-LED PROBE LENGTHS



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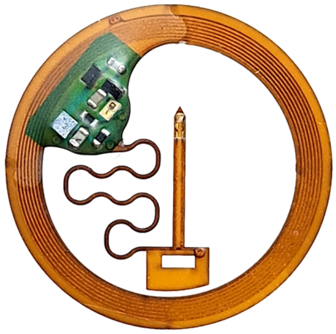

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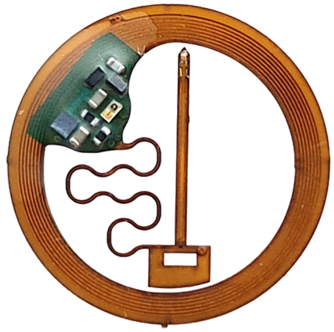
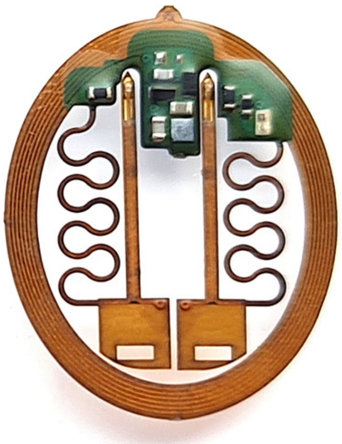


6mm

Bilateral device

The newly-released bilateral device mounts sub- dermally on top of the animal's skull, incorporating two independent probes each with a µ-LED at the end to deliversimultaneous bilateral stimulations into two distinctive target brain regions.

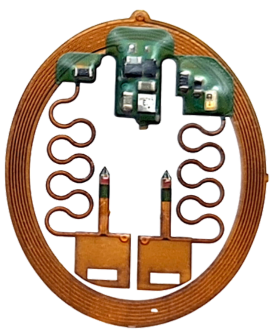


Size: 11.5 x 1.3 mm (L x W x thickness)

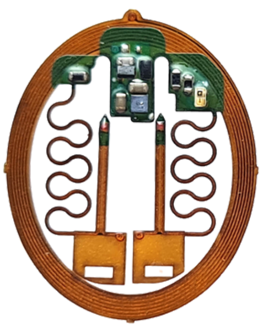
Weight: 30 mg or less

Wavelength: 470 nm (blue), 530 nm (green), 590 nm (yellow), 630 nm (red)

µ-LED PROBE LENGTHS



2mm



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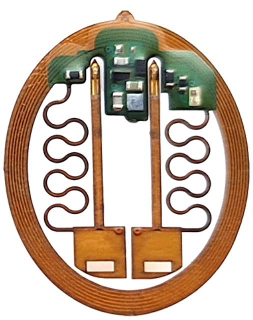

6mm

Brain Device Implantation

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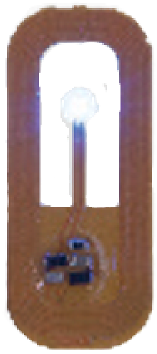
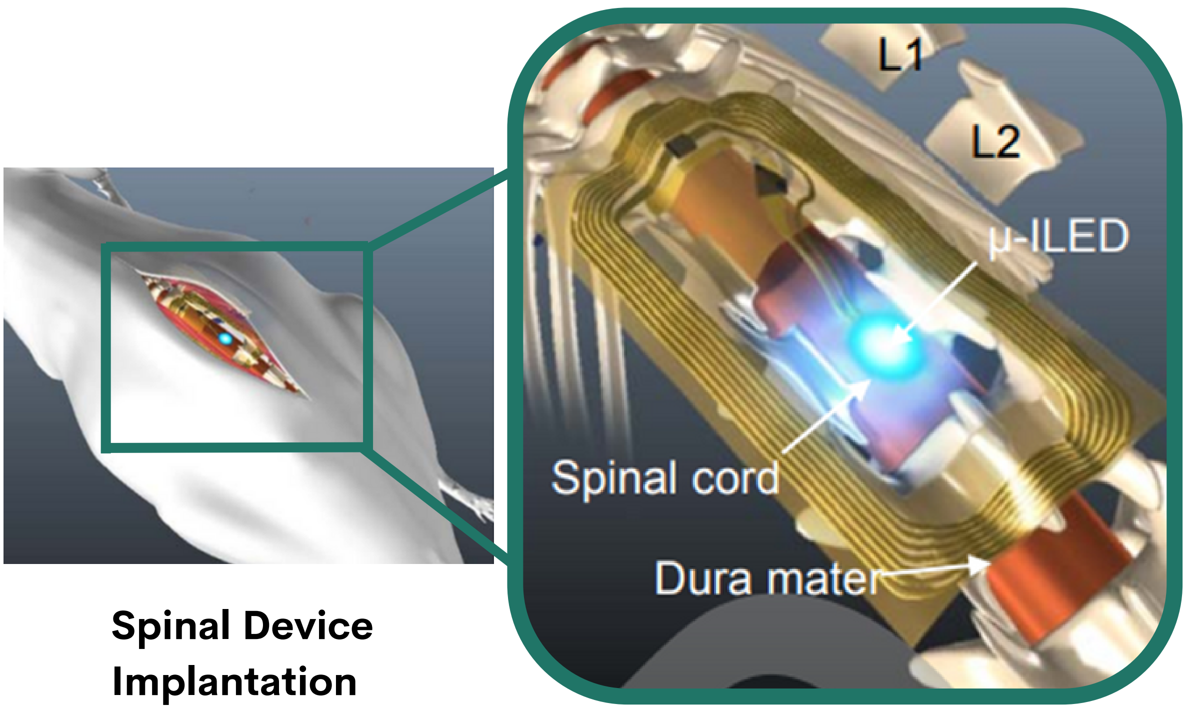
Spinal Device

The flexibility, lightweight construction, and open oblong design of the spinal device, along with its single μ-LED probe, allow for straightforward surgical implantation and long-term experimental study designs.



Size: 10.5 x 5 x 1.3 mm (L x W x thickness)
Weight: 20 mg or less
Wavelength: 470 nm (blue), 530 nm (green), 590 nm (yellow), 630 nm (red)



Spinal Device Implantation

UPCOMING DEVICES

Spring 2022

Optofluidics

Wireless, implantable optofluidic system for programmable pharmacological delivery and optogenetic stimulation.

Long-Range

Extended operational range to
enclosure areas of up to 100 x 100 cm, and beyond. These devices include programmable, fixed power settings to eliminate any Spatio-temporal variations in intensity and to allow digital control over the μ-LED output.

Summer 2022

High Intensity Optogenetics

Optimized for transcranial optogenetic stimulation in freely moving subjects.

Fall 2022

Photometry

These devices provide deep brain fluorescence measurements of neural activity with additional options in optogenetic stimulation. This back-mounted platform retains the same wireless, battery-free, implantable form factor of existing NeuroLux devices.

Spring 2023

EEG / EMG / OPTO

Battery-free, fully implantable EEG, EMG, and temperature recording devices that mount subdermally in the back of small animals. The device body connects through thin, stretchable wiring to electrodes that interface to the brain and muscle tissue. It can also be integrated with optogenetic probes for simultaneous closed-loop stimulation/inhibition of target brain regions.

PUBLICATIONS

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