High Efficiency Wireless Power Transfer For Implanted Devices

A method for designing wireless coils that produce lower eddy-current losses in the metal enclosure of implantable medical devices

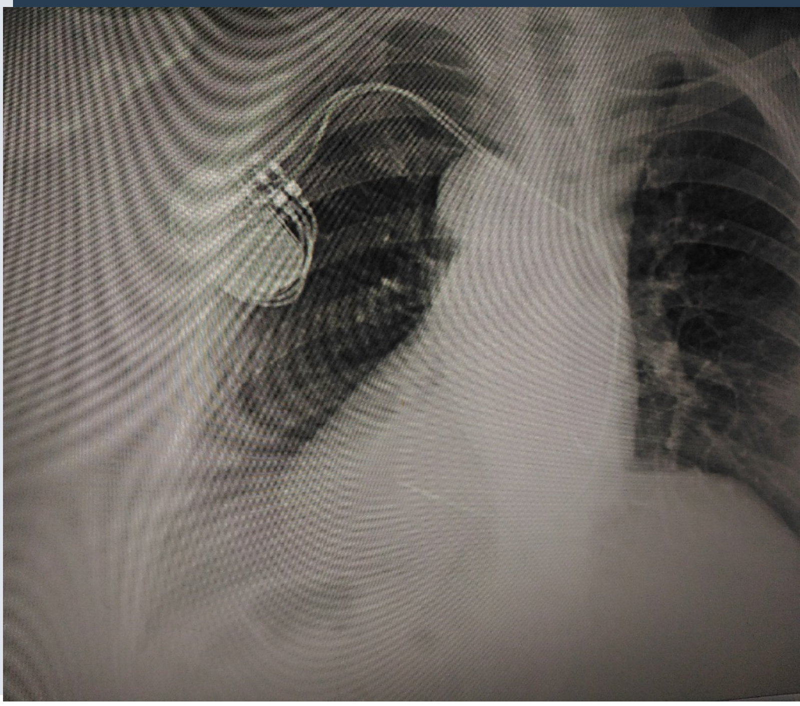
Reference: Implanted Devices

Objective

- Seeking investment
- Licensing
- Commercial partner
- Development partner

Applications

The developed technology can be utilised in several types of battery and battery-less implantable medical devices such as neurostimulators, pacemakers and pain management devices



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Tech Overview

This technology provides a method for designing wireless coils that produce lower eddy-current losses in the metal enclosure of implantable medical devices than existing coils, and therefore results in reduced heating of body tissues in the vicinity of the implant during battery recharging. Modelled power levels to date indicate that a reduction in implant losses by up to 30% is provided.

The efficient wireless coils are also applicable in the design of a battery-less implantable device, where the new coils produce less tissue heating due to electromagnetic field (EMF) heating than conventional designs.

This technology proposes a method for designing optimum coil structures that maximise flux linkage between transmitter and receiver coils, each having a restricted size, for a given maximum allowed level of H field (and therefore SAR) produced within body tissues. The same approach reduces heating due to eddy currents in devices that have a metal enclosure. In this way, the maximum level of magnetic coupling between transmitter and receiver coils is produced, and therefore the maximum level of power can be transmitted without exceeding electromagnetic field regulations or tissue heating limits. The invention is compatible with the design of different types of efficient driver circuits on the transmitter side and rectifier circuits on the receiver side. Furthermore, it is applicable to receiver coils with air-cores and magnetic cores. Finally, it is applicable in systems which have both or one of the transmitter and receiver coils implanted.

Background

Existing rechargeable medical implants are bulky, inefficient, and raise safety concerns due to tissue heating caused by ohmic losses incurred during battery recharging. Heating is a significant problem which has resulted in some implant product recalls, and therefore many researchers are focusing on solutions for overcoming it.

Benefits

The technology is applicable for both conventional and high frequency stimulation therapies

Higher power transfer rate may reduce time taken for charging or enable charging a larger battery at the same rate as in current products

- Larger battery could increase the battery life between recharges
- Larger battery could enable higher stimulation levels or device improved functionality; e.g. activity response stimulation programming.

For the battery-lessimplant:

- Enables a 50% reduction in implantable device thickness compared to current competitor stimulator devices.
- Allows for 30% more power- enabling the implantable device to have higher functionality/smaller size.
- Increases implant lifetime.
- Provision of programming interface on the external pulse generator would provide improved flexibility in user programming

Further Details

Other claimed solutions in the literature include the use of heat sinks within the implant to reduce coil heating and tissue heating. Also, other proposed solutions suggested the use of magnetic ferrite materials to concentrate the magnetic fluxes into the direction of the implant coils. The proposed solution is compatible with both these approaches and would provide further improvement than that achieved with these solutions alone.

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