This work is part of the CANDO (Controlling Abnormal Network Dynamics using Optogenetics) project; a world-class, multi-site, cross-disciplinary project to develop a cortical implant for optogenetic neural control. The goal is to create a first-in-human trial in patients with focal epilepsy.

The 4WiCS is a distributed technologies platform designed to interface an implant system to control and peripheral modules (slaves) and comprise the following components:

- **Central Implant (CI):**
  - Implants linked with wires to an inductor coil
  - Modules are linked to a central power unit
  - Compatible with multiple types of electrodes
  - Modules are linked to a central power unit

- **Multi-Module Implants:**
  - Distributed implantable system
  - Multiple active peripheral implants (optrodes)
  - Closed-loop adaptive treatment

- **Implantable Lead:**
  - Implantable lead for power and data communication

- **4-Wire Communication System (4WICS):**
  - Supports data and power communication
  - Distributed technologies for high level control, command generation, and data monitoring, connecting to the control unit through UART/USB interface

- **REFERENCES:**
  - Authors: Dorian Haci, Andrea Mifsud, Yan Liu, Sara S. Ghoreishizadeh, Tim G. Constandinou
  - Journal: IEEE Transactions on Biomedical Circuits and Systems
  - Pages: 584–587
  - Year: 2017

The 4WICS protocol is implemented on a custom PCB including:

- Power management
- Downlink line drivers
- Uplink line receivers

- SPI clock
- Address

- Downlink Data

- Uplink Data

- SPI Converter

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