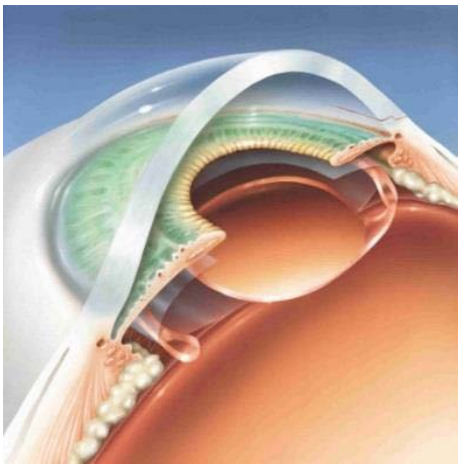
EYEPRESS: autonomous implantable system for intraocular pressure monitoring



Low-power design combined with energy harvesting techniques extend battery life of implantable, wearable and IoT devices. Besides, wireless IoT devices avoid clumsy wiring installations and keep electromagnetic interferences at a minimum.

The specific goal of this project is the **development of an autonomous implantable device to allow a constant monitoring of the IntraOcular Pressure (IOP)** to improve the prevention, control or treatment of the glaucoma disease. Glaucoma is one of the main causes of irreversible blindness in the world. Current diagnosis procedures consist of taking IOP measurements while the patient is being examined by the ophthalmologist. Measuring the intraocular pressure by an IOP device can help to the early diagnosis of glaucoma and to slow down the time course of the disease.

The research carried out within the scientific program *Autonomous Sensors at CiTIUS* and *International Nanotechnology Laboratory (INL)* in Braga (Portugal) includes the design and test of several light **energy harvester chips in standard CMOS technologies**, as well as **pressure sensors in Micro Electromechanical Systems (MEMS) technology**.

Characteristics of the system

Energy harvesting system

- Cold start from 2.38 nW, range of operation from nW to uW.
- Energy harvesting system in a unique integrated circuit.
- No need of external control elements.
- Adaptability to other solar cell sizes, both internal and external.
- Adaptability to other energy sources, like thermoelectric gradients.
- Size of 4 x 4 mm2. Thickness- 1.5 mm2.

Pressure sensor

- Absolute pressure range- 600- 800 mmHg with 1 mmHg of resolution
- Gage pressure range- 0- 60 mmHg with 1 mmHg of resolution

Applications

- ✓ Implantable devices
- ✓ Wearables
- ✓ Wireless sensors in Internet of Things (IoT)

Commercial Status

- **Technology Readiness Level:** TRL-4
- Interested in industrial partners for a joint development of the technology
- Energy harvesting system and pressure sensor available for exclusive or non-exclusive licensing

Spanish Patent: *Sistema de Micro-Recolección de Energía con Unidad de Gestión de Energía y Celda Solar en un Único Substrato de Silicio.* Ref. 201730001. OEPM