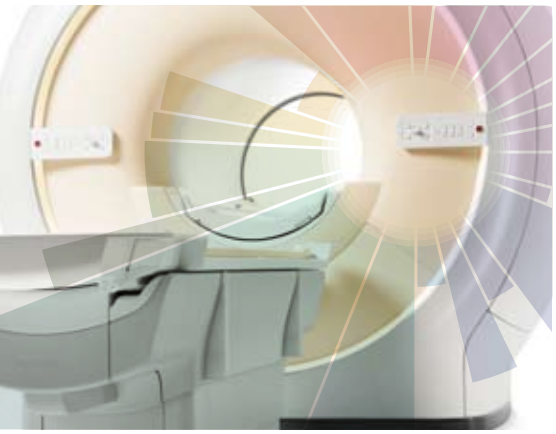
CALL 2012-1

Project profile

DeNeCor

Devices for NeuroControl and NeuroRehabilitation



Aging of population results in an increased incidence of neurological diseases. Often, several diseases may affect the same patient, and the diagnosis techniques or the therapy for one may be incompatible with the techniques needed to address the other one.
The objective of the ENIAC JU project DeNeCor is to demonstrate the coexistence by design between implanted neuromodulation therapy devices and key diagnostic systems.

Area

- Health Care and Ageing Society
- Energy Efficiency

Objectives

Aging population will strongly increase the incidence of neurological conditions like Parkinson disease, epilepsy, stroke survivors and pain management leading to a strong augmentation of co-morbidity (the presence of one or more diseases in addition to a primary disease). Consequently there is an increase in diagnosing and treating patients already carrying active implanted medical devices and brain computer interfaces. Electronic neuromodulation therapy is typically perceived as a last-resort treatment because of its incompatibility with key neurological diagnostic systems as ElectroEncephaloGraphy (EEG) and Magnetic Resonance Imaging (MRI). However the coexistence of therapeutic and diagnostic devices and systems is not only imperative with regards to co-morbidity but the effectiveness and efficiency of therapeutic treatments can also be multiplied by the simultaneous registration of neuronal functions. No neuromodulation system available in the market is currently 'MRI' safe; late stage patients with Parkinson's neurodegenerative diseases can only undergo MRI-scans of a very restricted nature after implantation of neuromodulation devices. This is seen as one of the top issues by all the key opinion leaders in this field. DeNeCoR intends to demonstrate designed coexistence between therapy devices and diagnostic systems.

Work and consortium, expected results

Firstly, DeNeCoR will contribute to the validation of the Technical Specification IEC/ISO 10974 drafted by Active Implanted Medical Devices manufacturers (AIMD) and MRI manufacturers. This specification is a challenge for the implanted therapeutic devices to become miniaturized and include shielding, while the MRI systems will need optimized magnetic field generation and detection circuitry with specific topology and improved embedded software control.

Secondly, DeNeCoR will extrapolate the IEC/ISO 10974 specifications to other diagnostic systems and the interaction between diagnostic systems and non-invasive electronics based neuromodulation therapies. In particular DeNeCoR targets:

- Demonstration of an MRI compatible Transcranial Magnetic Stimulator (TMS) with focused spatial localization. This requires distribution and miniaturization of power electronics.
- Development of new sensor and packaging technology for invasive and non-invasive neural sensing (e.g. EEG), compatible with the MRI and TMS environment. The demonstration includes connection to neuro-modulation and neuro-rehabilitation devices.
- Demonstration of an MRI-guided endoscopic system with integrated ultrasound system, based on innovative Capacitive Micromachined Ultrasound Transducers (CMUT), miniaturization of electronics and 3D packaging.

Thirdly, DeNeCoR will develop methods to independently test the therapy devices and the diagnostic systems. This way, the demonstrator developments can be decoupled, allowing the technical evolution of all systems at their own pace for increased efficiency.

The clinical partners are fully integrated in the consortium to contribute to the requirements and help develop clinical procedures for adopting and assuring market acceptance of the innovations enabled by DeNeCoR.

Impact

DeNeCoR will remove the main roadblock of incompatibility between the neuromodulation therapy (DBS & TMS) and the neurological diagnostic systems (EEG, MRI & US) inducing a higher preference rate among clinicians. The compelling evidence of efficacy and safety will result in further developments of neurostimulation therapy and will generate strong intellectual property. This will be an important business accelerator, enabling Europe to leapfrog the competition, to increase its market share in therapy devices and strengthen its leading position in the diagnostic systems, raising the bar for new competitors intending to enter the profitable healthcare market.

Health Care and Ageing Society

Partners

- Philips Medical Systems Nederland B.V.
- Sapiens Steering Brain Stimulation B.V.
- Universitair Medisch Centrum Utrecht
- Stichting Kempenhaeghe
- Technische Universiteit Eindhoven
- Stmicroelectronics Srl
- Politecnico di Torino
- Universita Degli Studi di Pavia
- Universita Degli Studi Roma Tre
- Universita Degli Studi di Firenze
- Ait Austrian Institute of Technology Gmbh
- Guger Technologies Og
- Plessey Semiconductors Limited
- University of Sussex
- The Magstim Company Ltd
- Institut Mikroelektronickych Aplikaci s.r.o.
- Vysoké Učení Technické v Brne
- Acondicionamiento Tarrasense Associacion
- G.Tec Medical Engineering Spain
- Fraunhofer-Gesellschaft zur Foerderung Der Angewandten Forschung e.V
- Mr Comp Gmbh
- Polydiagnost Gmbh

Project co-ordinator:

- Mark van Helvoort, Philips

Key project dates:

- Start: 01.06.2013
- Finish: 31.3.2016

Countries involved:

- Austria
- Czech Republic
- Germany
- Italy
- Spain
- The Netherlands
- United Kingdom

Total budget:

- € 19.9 million

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