Rapid Adaptive Nonlinear Gradient Encoding for Magnetic Resonance Imaging

Fact Sheet

Project Information

**RANGEMRI**

Grant agreement ID: 282345

Status
Closed project

Start date
1 February 2012

End date
31 January 2017

Funded under
FP7-IDEAS-ERC

Overall budget
€ 1 497 672

EU contribution
€ 1 497 672

Hosted by
UNIVERSITAETSKLINIKUM
FREIBURG

Germany

Objective

The project is aimed at the development of novel approaches for flexible signal localisation and encoding in Magnetic Resonance Imaging (MRI) for applications in neuroscience, neurology, oncology and further areas. The Rapid Adaptive Nonlinear Gradient Encoding for Magnetic Resonance Imaging (RANGE) methodology is based on the concept of applying localised, generally nonlinear encoding fields to faster, customised and anatomically-aligned imaging. The increase in encoding efficiency originates from several key factors: (i) local fields can be tailored to reduce peripheral nerve stimulation and power requirements to allow for faster switching; (ii) localised character of the fields requires less encoding steps and (iii) ability to select curved anatomy-adapted regions allows to cover target volumes with less slices; (iv) local encoding along curved surfaces reduces partial volume effects, delivering data of identical quality with lower nominal resolution compared to a standard approach.
Each of these aspects is expected to contribute a factor of at least 2 to 3, resulting in a total encoding efficiency boost of an order of magnitude. Flexible fields will also be used for very high order localised dynamic shimming, allowing to further increase acquired data quality.

The technological backbone for the RANGE principle will be provided by a novel highly-integrated switchable matrix gradient coil. The new coil type will be able to generate both local nonlinear and global linear fields. Upon proper industrial realisation it is expected to match or even outperform traditional linear gradient coils, while providing an ultimate flexibility in generating rapidly switched localised fields.

Hardware, methodology and operator interface to the scanning process will be developed to handle signal selection, localisation and encoding in curved nonlinear coordinates to streamline the application development and facilitate the transfer to clinical practice and neuroscientific research.

Field of science

/medical and health sciences/basic medicine/neurology
/medical and health sciences/clinical medicine/radiology/medical imaging/magnetic resonance imaging
/medical and health sciences/clinical medicine/oncology
/natural sciences/biological sciences/neurobiology
/natural sciences/biological sciences/neurobiology/neuroscience

Programme(s)

Topic(s)

Call for proposal

ERC-2011-StG_20101109

Funding Scheme

ERC-SG - ERC Starting Grant

Host institution

UNIVERSITAETSKLINIKUM FREIBURG

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Beneficiaries (1)

UNIVERSITAETSKLINIKUM FREIBURG

Germany

EU contribution

€ 1 497 672

Address

Hugstetter Strasse 49
79106 Freiburg

Activity type

Higher or Secondary Education Establishments

Contact the organisation

Principal investigator

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