A dedicated TRImodality (PET/MR/EEG) imaging tool for schizophrenia

Call: FP7-COOPERATION. FP7-HEALTH-2013-INNOVATION-1

A European Collaborative project supported through the Seventh Framework Programme for Research and Technological Development
The problem

Schizophrenia affects about 7 per 1000 of the adult population but because the disorder is chronic the overall incidence is high, at around 1% of the population. The cost per person with psychotic disorders is close to 20,000 € per year on average. The earlier the treatment is initiated, the more effective it is, however the majority of people with schizophrenia do not receive treatment, which has the effect of prolonging their illness.

TRIMAGE aims to create a trimodal, cost-effective imaging tool consisting of PET/MR/EEG using cutting edge technology with performance beyond the state of the art. The tool is intended for broad distribution and will enable effective early diagnosis of schizophrenia and possibly other mental health disorders.

- The TRIMAGE project has already accomplished the following results:
  - MRI part:
    - The system integration along with the cryogen-free 1.5T magnet has been completed and the first prototype has been tested. The MRI pulse sequence and protocol are currently under construction
  - PET part:
    - Monte Carlo simulations of the system have been performed and design is finalized - First results with brain phantoms achieved
    - Attenuation and motion corrections are completed. PET image reconstruction, partial volume and scatter corrections, kinetic analysis and parametric reconstruction are about to be completed
Clinical - Recruitment of subjects and testing the new paradigms on existing systems have been performed. 62 subjects (38 schizophrenic patients/24 controls) have been scanned with a Siemens mMR (Technische Universität Munich) and their data are being analyzed.

PET module assembling. The PET ring, consisting of consecutive cassettes is being developed. The cassette configuration is as seen in detail.

PET/MR fusion images acquired. Reconstructed [18F]-FDOPA-PET image (65-70 mins) overlaid on T1w (top) and net influx rate (min-1) parametric map overlaid on T1w (bottom).

Dimensional outline (left) and artistic view (right) of the dedicated brain PET/MR/EEG system (EEG cap not shown).
The Consortium
The TRIMAGE consortium brings together 11 multi-disciplinary partners from 5 European countries, and is based on high-level scientific expertise from Universities, Research Centres and SMEs.

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<tr>
<th>Project Partners</th>
<th>Role in the project</th>
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<tr>
<td>University of Pisa (UNIPI)</td>
<td>Coordinator &amp; PET system development</td>
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<td>Technological Educational Institute of Athens (TEIA)</td>
<td>Dissemination &amp; Monte Carlo simulations</td>
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<tr>
<td>Forschungszentrum Juelich GmbH (FZI)</td>
<td>Coil design &amp; PET/MR/EEG integration</td>
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<td>JARA BRAIN, RWTH (JRB)</td>
<td>Clinical application</td>
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<td>Technische Universitat Munich (TUM)</td>
<td>Image quantification &amp; clinical application</td>
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<td>University of Zurich (PUK)</td>
<td>Patient recruitment &amp; clinical data analysis</td>
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<tr>
<td>Istituto Nazionale di Fisica Nucleare (INFN)</td>
<td>PET system development &amp; characterization</td>
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<td>AdvanSiD (ASD)</td>
<td>SiPMs and chip-scale package development</td>
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<td>WeeROC (WRC)</td>
<td>PET modules production &amp; testing</td>
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<td>Raytest GmbH (RAY)</td>
<td>Mechanical parts design &amp; market strategy</td>
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<td>RS2D (RS2D)</td>
<td>1.5 MR scanner design &amp; development</td>
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Contact
Scientific Coordinator
Prof. Alberto DEL GUERRA
University of Pisa, Italy
alberto.delguerra@df.unipi.it

Dissemination Manager
Ms. Theodora Christopoulou
TEI Athens, Greece
thchristopoulou@gmail.com

Exploitation Manager
Jean-Luc Lefaucheur
Raytest, France
lefaucheur@raytest.com

Project Office
Project Trimage Office
University of Pisa, Italy
trimage_po@df.unipi.it

Project website
www.trimage.eu

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