

What is ANDREA?



ANDREA is a 4-year EU funded project dedicated to the development of a novel dry electrode system (HW and SW components) for EEG applications through research collaboration and exchange among academic and industrial partners. ANDREA started 1 Jan 2014 and will end 31 December 2017.

Action: Marie Curie PEOPLE **Funding scheme:** Industry-Academia Partnership and Pathways (FP7-PEOPLE-2013-IAPP)

The ANDREA Consortium

Merges complementary expertise and resources in biomedical engineering, material science, biomedical signal processing, neuroscience available at 3 academic and 2 commercial partners from 3 European countries:

- ✓ **Coordinator** BIND-Behavioral Imaging and Neural Dynamics Center, University of Chieti (Italy)
- ✓ Technische Universität Ilmenau (Germany)
- ✓ Universidade do Porto (Portogallo)
- ✓ eemagine Medical Imaging Solutions GmbH (Germany)
- ✓ Casa di Cura Privata Villa Serena (Italy)

General objectives

Action FP7-PEOPLE-2013-IAPP aims to:

- ✓ promote the participation of industry (and the private sector) in research,
- ✓ strengthen scientific collaborations between European industries and universities,
- ✓ foster knowledge transfer between the public and the private sectors **though:**
- ✓ sharing of expertise and resources among partners in research
- ✓ intersectoral mobility of researchers among partners
- ✓ training courses for knowledge exchange also with external researchers
- ✓ recruitment of experienced researchers from outside the consortium

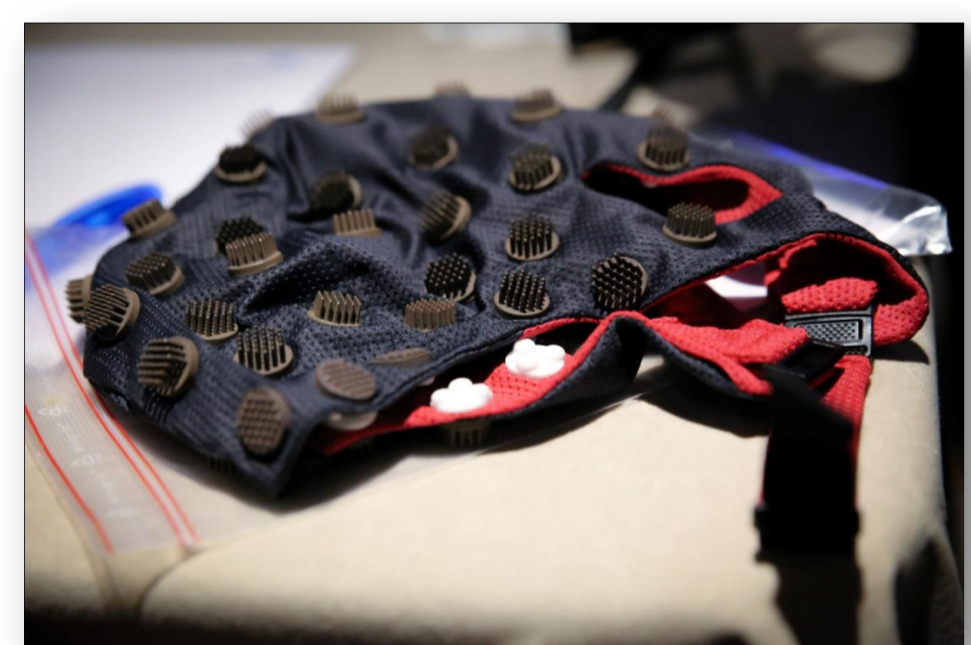
Scientific objectives

The purpose of the ANDREA project is to develop a novel dry electrode EEG system:

- ✓ **HARDWARE:** novel dry EEG cap system (innovative flexible dry electrodes, adjustable cap network provided with an automated sensor positioning mechanism and active preamplification)
- ✓ **SOFTWARE:** novel software solutions for the automatic classification and removal of artifacts from EEG signals
- ✓ **VALIDATION:** the overall performance and applicability of the novel system (HW & SW components) are tested in real life scenarios of EEG usefulness in iterative loops: clinical neurological practice and sports applications.



Prototyoe of 97 equidistant multi-pin dry electrode cap.



First ANDREA prototype of 64 dry cap with electrodes of adjusted shape on the forehead.



Acquisition set-up with cyclists.

The novel technologies address the requirements of:

- ✓ high signal quality
- ✓ high signal reliability
- ✓ mobility
- ✓ high patient/subject comfort
- ✓ long-term use

Advantages of dry electrodes:

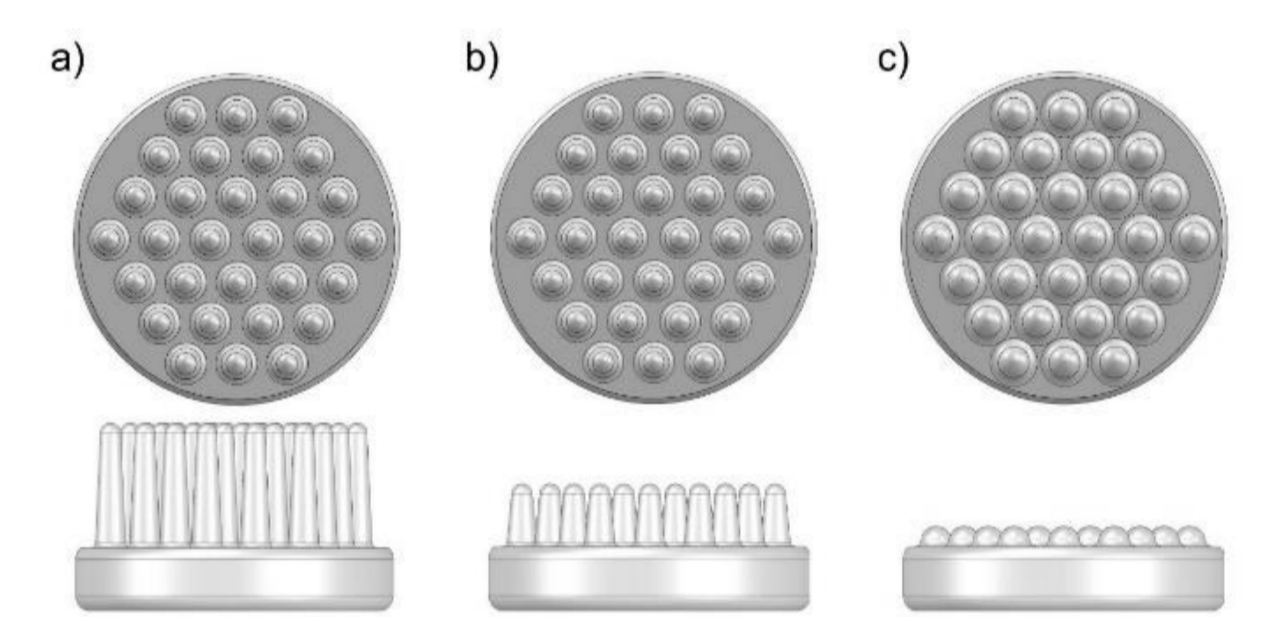
- ✓ optimized substrate flexibility
- ✓ adapted electrode shapes for different head regions
- ✓ multipin shape for optimal interfusion
- ✓ Ag/AgCl coating for optimal electrical contact
- ✓ short mounting time
- ✓ Lack of skin allergies

Software components:

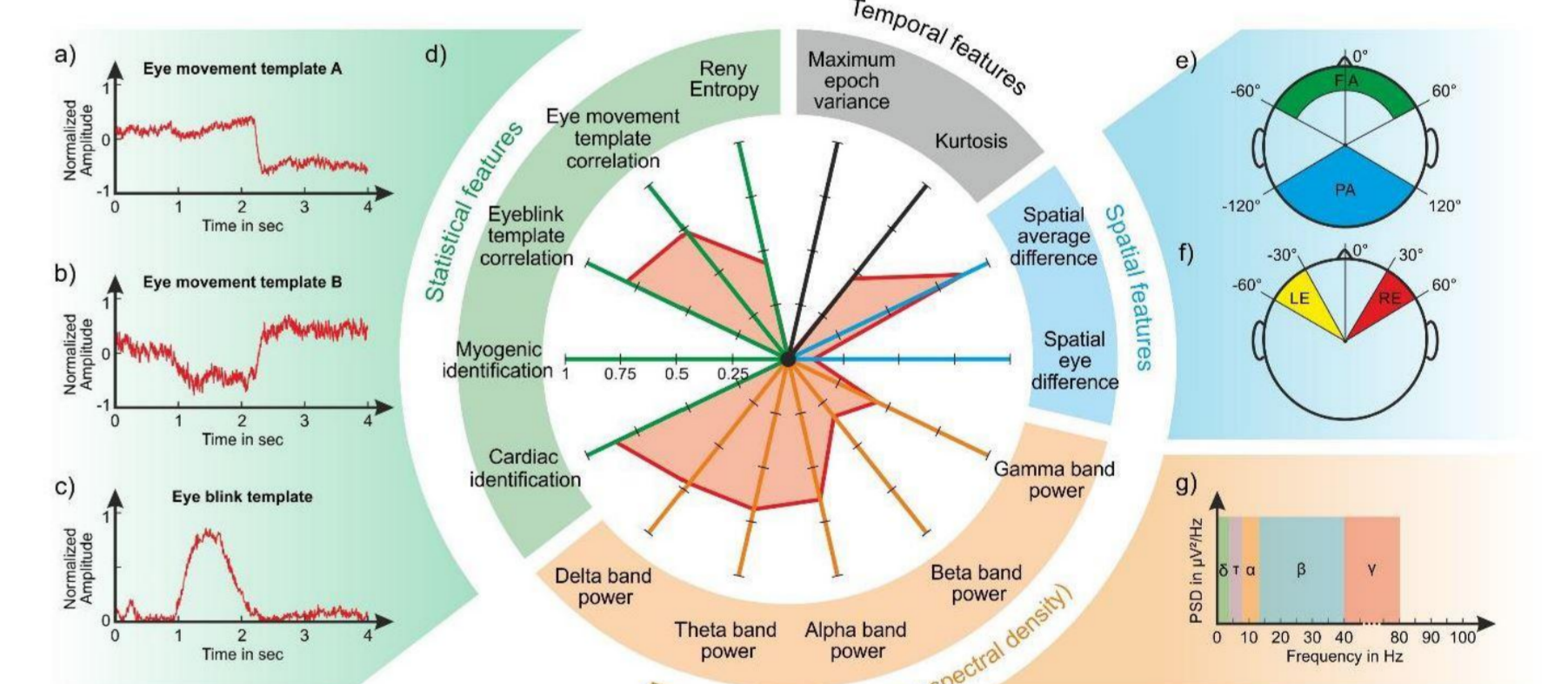
- ✓ Automatic algorithms for conversion between different electrode layouts included in the EEG user software
- ✓ Automatic artifact classification algorithms
- ✓ Automatic artifact rejection algorithms included in the user SW

Validation of the novel dry EEG system in clinical neurology and sports:

- ✓ Preparation time, electrode-skin impedance, channel reliability, perceived comfort, electrode offsets and required dynamic range, cleaning, disinfection and wearing are evaluated in patients and athletes
- ✓ Artifact detection performance of the novel SW components is statistically evaluated
- ✓ Signal quality is estimated in comparison with commercial wet EEG system's signals



Adapted pin and electrode designs for different head areas and hair densities: a) 6 mm, b) 3 mm, c) 1 mm of height.



Approach to physiological artifact classification.

Transfer of knowledge

- ✓ **Local level:** through the recruitment of researchers with complementary expertise
- ✓ **Peer-to-peer level:** through the intersectoral secondments between partners
- ✓ **Network-wide level:** through the Supervisory Board meetings, the 7 ANDREA training courses (scientific and soft skills), and the final ANDREA Conference



Expected impact

- ✓ Excellent science at European level
- ✓ Increase of intersectoral proficiencies of all partners' staff members
- ✓ Long-lasting collaboration between commercial and academic partners
- ✓ Contributions of research results to the knowledge economy and society in Europe

ANDREA partners' webpages

- ✓ BIND-Behavioral Imaging and Neural Dynamics Center, University of Chieti (Italy) (<http://bindcenter.eu>)
- ✓ Technische Universität Ilmenau (Germany) (<http://www.tu-ilmenau.de/en/institute-of-biomedical-engineering-and-informatics>)
- ✓ Universidade do Porto (Portogallo) (https://sigarra.up.pt/feup/en/WEB_PAGE.INICIAL)
- ✓ eemagine Medical Imaging Solutions GmbH (Germany) (<http://www.eemagine.com>)
- ✓ Casa di Cura Privata Villa Serena (Italy) (<http://www.villaserena.it>)